VOL. 177 No. 6 NOVEMBER, 1952

B 395060
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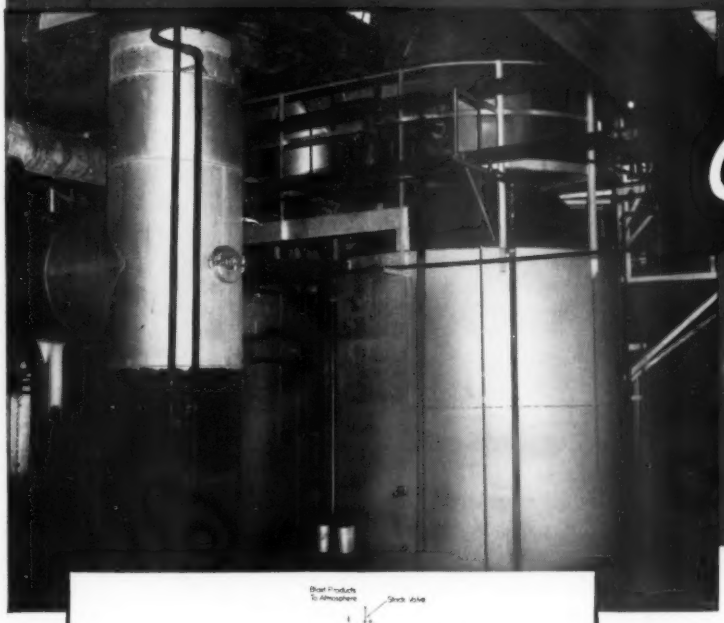
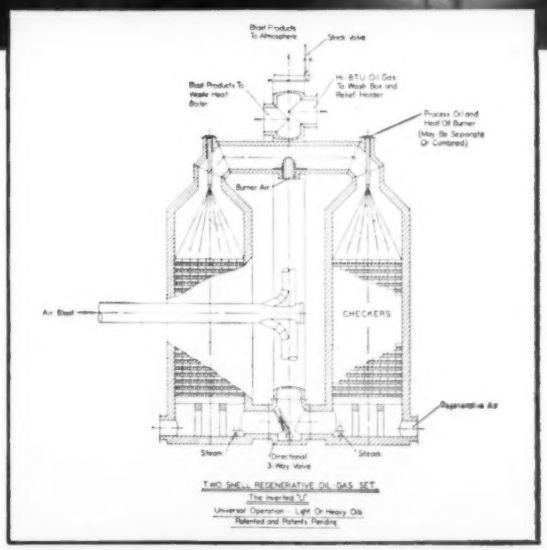
AMERICAN Gas Journal

OIL GAS GENERATION at its best



GASMACO'S

TWO SHELL SET



TWO SHELL REGENERATIVE OIL GAS SET
The Inverted "U"
Universal Operation - Light Or Heavy Oils
Patented and Patents Pending

SERIAL RECORD
JAN 23 1953
COPY

Flexible—operates with suitable light or heavy high carbon gas oils, including Bunker C. Efficient—lowest production cost on a therm basis . . . low investment cost . . . reduced manpower requirements for both operation and maintenance. Saves floor space. Makes possible the recovery of valuable by-products. Dependable—positive, quick-starting, 24-hour operation.

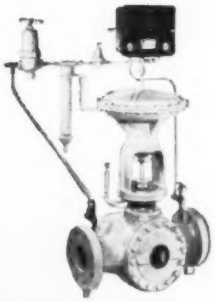
Has been field proved during the past four years in rugged, constant-duty plant service. Ask the operators who live with it; ask the companies who profit from it.

THE GAS MACHINERY COMPANY
16112 WATERLOO ROAD
CLEVELAND 10, OHIO

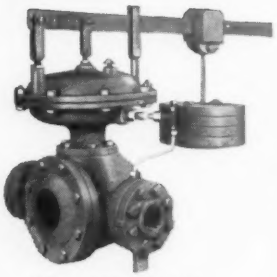
Designers • Fabricators • Erectors
Gas Plant Equipment and
Industrial Furnaces
THE GAS MACHINERY CO. (Canada) Ltd.

The ROCKWELL Replaceable Inlet Bowl

HIGH PRESSURE-015
Pilot Loaded

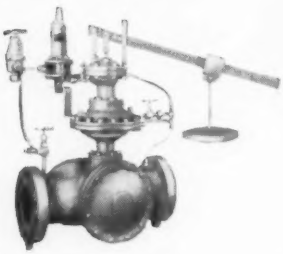


HIGH PRESSURE-015
Instrument Control

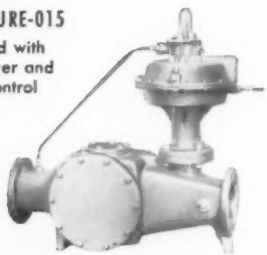


HIGH PRESSURE-015
Lever and Weight Type

HIGH PRESSURE-015
Spring Loaded

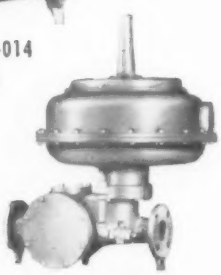


HIGH PRESSURE-015
Pilot Loaded with Auxiliary Lever and Weight Control



LOW PRESSURE-014
Pilot Loaded

A SIZE AND TYPE FOR EVERY NEED



LOW PRESSURE-014
Either inside or outside weights or pilot loaded

SAVES STOCKING SPARE REGULATORS

Rockwell regulators rarely, if ever, need be lifted from the line for service. That's because the valve chamber (inlet bowl assembly) easily removes as a unit through a hand hole area in the body. A new or rebuilt assembly having either hard or soft seats readily bolts in its place. You can also use this feature to size a regulator up or down to take care of increased or decreased demands. Many utilities handle seasonal loads this way, at big savings in equipment inventory and labor. Contact the nearest Rockwell office for full details of this exclusive feature or write Rockwell Manufacturing Company, Pittsburgh 8, Pa. for bulletins.

ROCKWELL MANUFACTURING COMPANY
PITTSBURGH 8, PA.

ATLANTA • BOSTON • CHICAGO • HOUSTON • KANSAS CITY • LOS ANGELES
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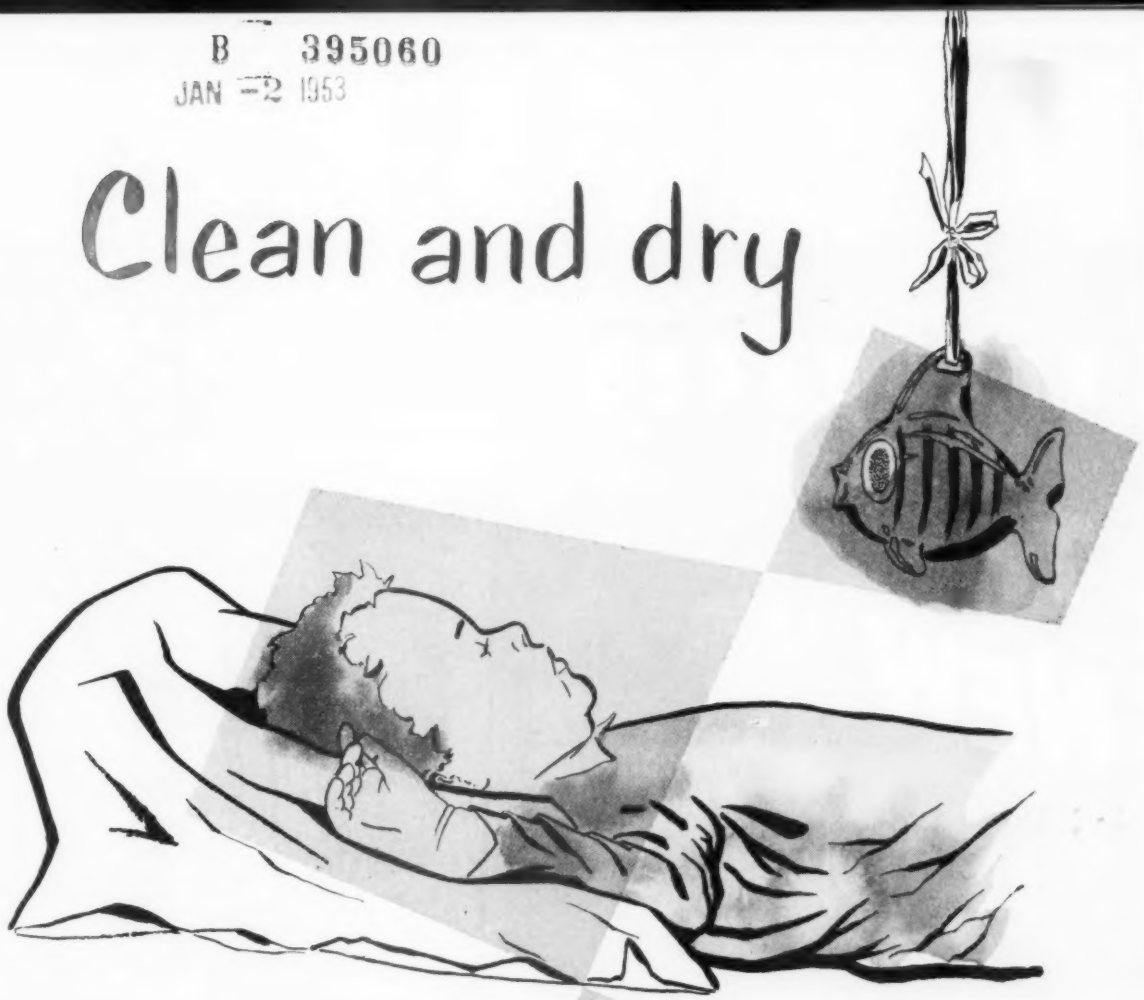
You Can RELY ON ROCKWELL

Balanced Valve REGULATORS

B 395060
JAN 2 1953

Clean and dry



That's how CAPTAN comes to you! The high standard of CAPTAN Odorants is maintained by practicing the same care and attention in its manufacture as might well be compared to the watchful care given to a baby. Manufacturing is done according to strict specifications and complete records are kept on every drum of CAPTAN. By such a system the customer is assured of receiving a product of uniformity, superiority and purity.

Every drum of CAPTAN is laboratory tested and must be clean and dry or be rejected at our own plant.

The excellent quality of CAPTAN was developed through years of experience in research and testing and by the use of the most efficient equipment and methods in manufacturing technique.

For the best in gas odorants, and especially for the specific CAPTAN that is best for you, call for the CAPTAN Man today.

NATURAL GAS ODORIZING CO., INC.

P. O. Box 1645 HOUSTON, TEXAS

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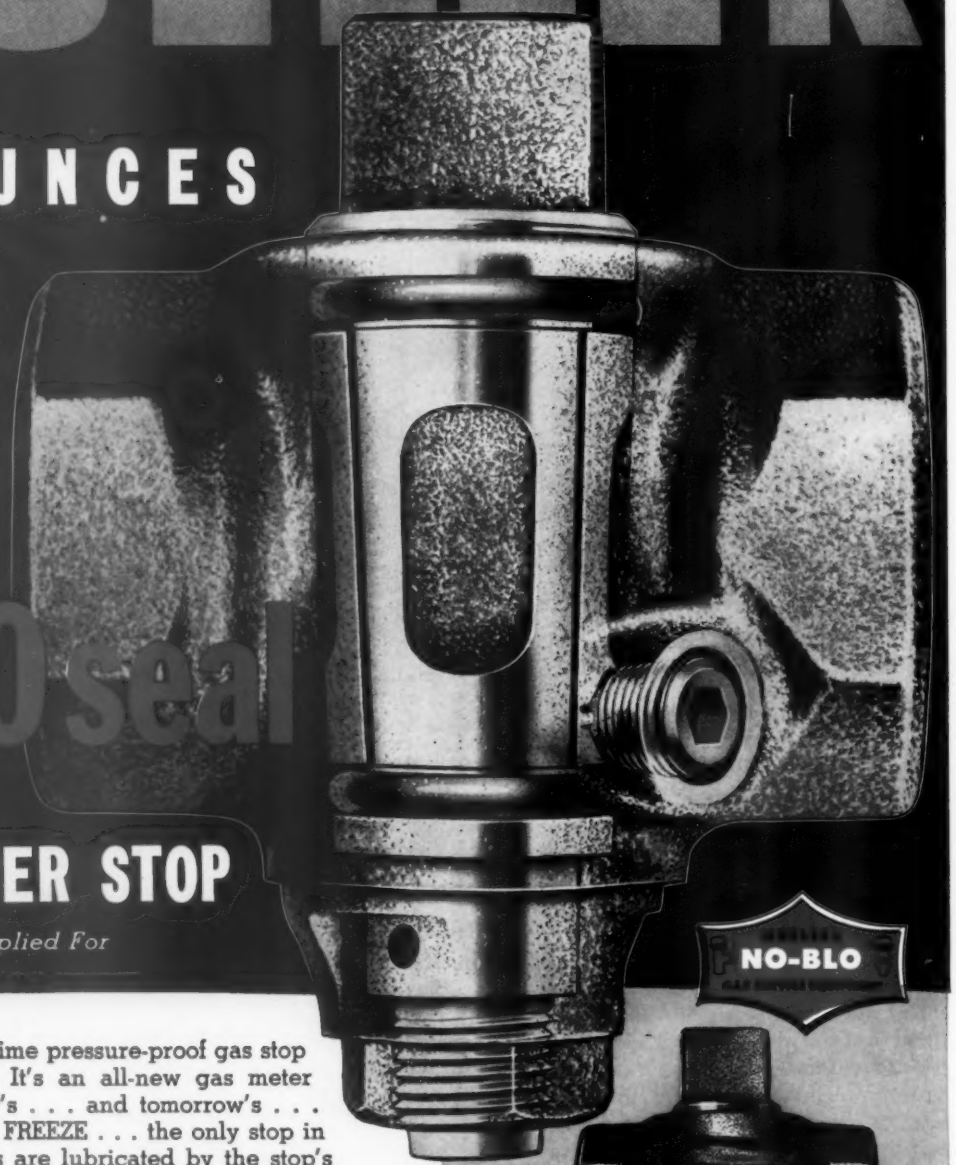
MUELLER

ANNOUNCES

THE NEW LubOseal

GAS METER STOP

Patent Applied For



LubOseal . . . the life-time pressure-proof gas stop you've been waiting for! It's an all-new gas meter stop engineered for today's . . . and tomorrow's . . . higher pressures. WON'T FREEZE . . . the only stop in which all contact surfaces are lubricated by the stop's grease system. By actual tests, LubOseal stops performed perfectly after 20 times the number of operations that would cause ordinary stops to leak or turn hard. TAMPER-PROOF . . . stem can't break, plug won't blow out. Precision lapped ground key stop assures tight fit. AUTOMATIC LUBRICATION . . . proper grease film is constantly maintained for an extended time. FACTORY ADJUSTED . . . proper adjustment is permanently fixed at the factory. HOLDING AND TURNING QUALITIES EASILY RESTORED . . . addition of grease under pressure through drilled hole restores holding and turning qualities. Modernize and protect your installations with LubOseal Gas Stop. Call your Mueller representative today.

Plain head H-11170 Lock wing H-11175
Sizes 3/4" through 2"

MUELLER CO.

Dependable Since 1857

MAIN OFFICE & FACTORY DECATUR, ILLINOIS

AMERICAN Gas Journal
ESTABLISHED 1859

VOLUME 177 NOVEMBER 1952 NUMBER 6

This month...

Currently it seems to have become the fashion to refer to gas appliance manufacturing as an ailing industry, and statistically we have no doubt that there is solid ground for this contention. But any visitor to the appliance and equipment show staged during the recent AGA convention would be bound to come away with the conviction that he had just visited one of the hardiest looking invalids that ever sat up and took nourishment. Yet we could not escape the conviction that the million dollars reported to have been spent on this gaudy carnival could have been employed to better advantage. By advertising, let us say, in the gas industry press for one thing.

• • •

A recurrent phenomenon in our mail about this time of year is a small flood of inquiries about the American Gas Handbook. We are happy to announce that the 1952 Edition of the Handbook is now in the mails, or perhaps more accurately, in the hands of the Post Office. What happens to a publication once it is entrusted to the couriers of that weary government department we no longer even try to fathom. In any event, every subscriber to American Gas Journal who is paid up should get his Handbook in short order.

• • •

Our predictions to the contrary notwithstanding, it is a source of great satisfaction to us to observe that the Public Relations program of GAMA is to be continued, and not abandoned as we had expected it to be. There are times when it is an unalloyed pleasure to have guessed wrong on what might happen, and this is one of them.

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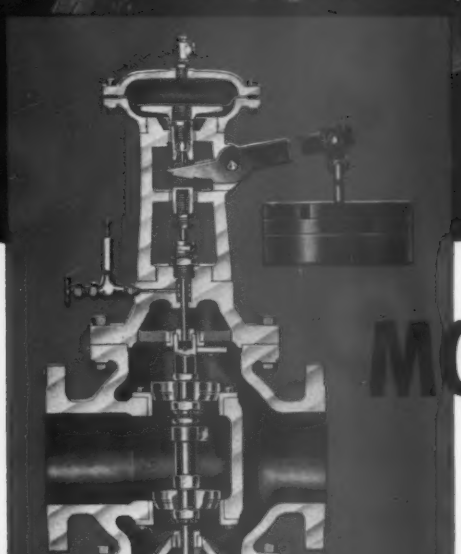
FOR *Loyal Performance*



MODEL 44—Reducing Regulators

This versatile pressure-reducing regulator may be direct-operated, pilot-loaded with "SENSITROL", or instrument-operated. It is excellent as a motor valve for use with differential-limit controls. The valve can be quickly removed or replaced without disturbing the regulator.

- Versatile
- Valve and Seats Removable
- Valve Types and Sizes Interchangeable
- Valve Adjustment Made Easy
- Compact Design
- High Safety Factor

ACCURATE CP MFG. CO. DEPENDABLE

Chaplin-Fulton

MANUFACTURING COMPANY

Pittsburgh 25, Pennsylvania

44-51-1

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FULL PAGE COLOR ADS IN 18 MAGAZINES

Industry's hardest-hitting campaign! Concentrated on prospects who are ready to buy now for:

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- Hospitals
- Schools
- Institutions
- Hotels
- Drug Stores
- Variety Stores
- Department Stores
- L-P Gas Installations
- Marine Field

The 1952 Garland campaign is selected and directed to reach not only the *largest potential market*—but also the *major buying influences* within each market! Garland advertising delivers you more "ready-to-buy" customers because Garland pin-points prospects with an exclusive story of value, prestige and dependability that is unequalled!

Yes, again in 1952 as in previous years, Garland leads the field with more down-to-earth selling support for its dealers, and for the gas industry. First in advertising, as in acceptance, performance and profit possibilities.

Sell Garland, the line that pre-sells more "ready-to-buy" customers! Sell the Line of the Leader!

GARLAND

DM PRODUCTS

Heavy Duty Ranges • Restaurant Ranges • Broilers • Deep Fat Fryers • Griddles • Broiler-Griddles • Baking and Roasting Ovens • Counter Griddles • Dinette Ranges

DETROIT-MICHIGAN STOVE CO., DETROIT 31, MICHIGAN

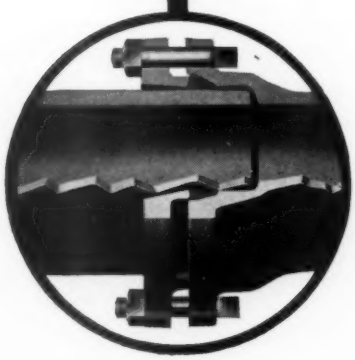
In Canada, GARLAND-BLODGETT, LTD., 2256 Eglinton Ave. W., TORONTO

Many important gas utilities have *standardized on standardized mechanical joint cast iron pipe* for new mains carrying all types of gas at low, intermediate and high pressures.

CAST IRON

Cast Iron Pipe Research Association, T. F. Wolfe, Managing Director, Peoples Gas Bldg., Chicago 3.

WHEN YOU BACKFILL an installation of standardized mechanical joint cast iron pipe you are sure of the two fundamental factors in economical gas distribution—long life and bottle-tight joints. More than two-thirds of the 43 largest cities in the United States have part or all of their *original* cast iron gas mains in service—some for more than a century.



standardized mechanical joint

CAST IRON PIPE

WHEN INSTALLING proves to be speedy and easy, time after time, you appreciate another advantage in standardizing with standardized mechanical joint cast iron pipe. More footage can be laid per day with minimum equipment and with less delays in wet weather and less difficulty with wet trenches. More than a quarter-century of experience has demonstrated the speed and simplicity of its bottle-tight construction. More than a century has proved its long life.

Leader ACROSS THE *Nation*

EMPIRE

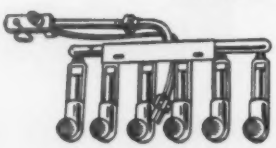
Gas
FLOOR FURNACES

- **LEAD IN DESIGN**
- **LEAD IN ECONOMY**
- **LEAD IN EFFICIENCY**

Heating Engineers and Architects throughout the nation specify Empire Gas Floor Furnaces.

EXCLUSIVE WITH EMPIRE
The **FAMED**
"Thriftmatic"

Gas
BURNER



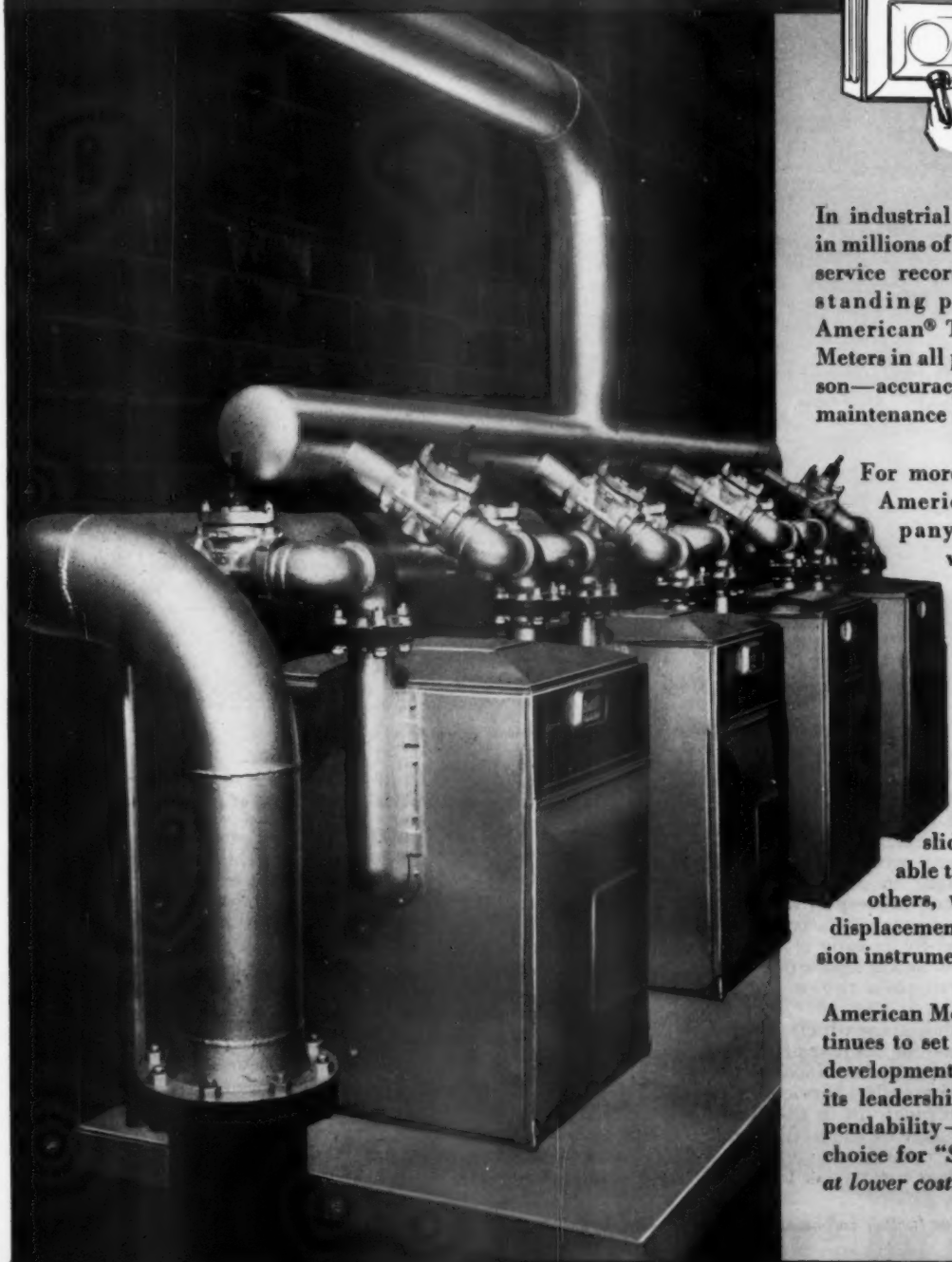
EMPIRE

SEE YOUR LOCAL EMPIRE REPRESENTATIVE OR WRITE DIRECT TO **EMPIRE**

STOVE COMPANY
BELLEVILLE, ILLINOIS
WORLD'S LARGEST MANUFACTURER OF *Gas* FLOOR FURNACES

ACCURATE MEASUREMENT

at lowest unit cost per year



In industrial installations and in millions of residences, utility service records show the outstanding performance of American® Tinned Steelcase Meters in all points of comparison—accuracy, ruggedness, low maintenance cost and long life.

For more than 115 years, American Meter Company has pioneered with such improvements as Soldered Seal index boxes, valve seats and crank bearing cast into valve tables, self-lubricating porous bronze bearings, smooth sliding valves, adjustable tangents, and many others, which have made displacement meters the precision instruments they are today.

American Meter Company continues to set the pace in meter development thus maintaining its leadership in metering dependability—always your first choice for *"Sustained accuracy at lower cost."*

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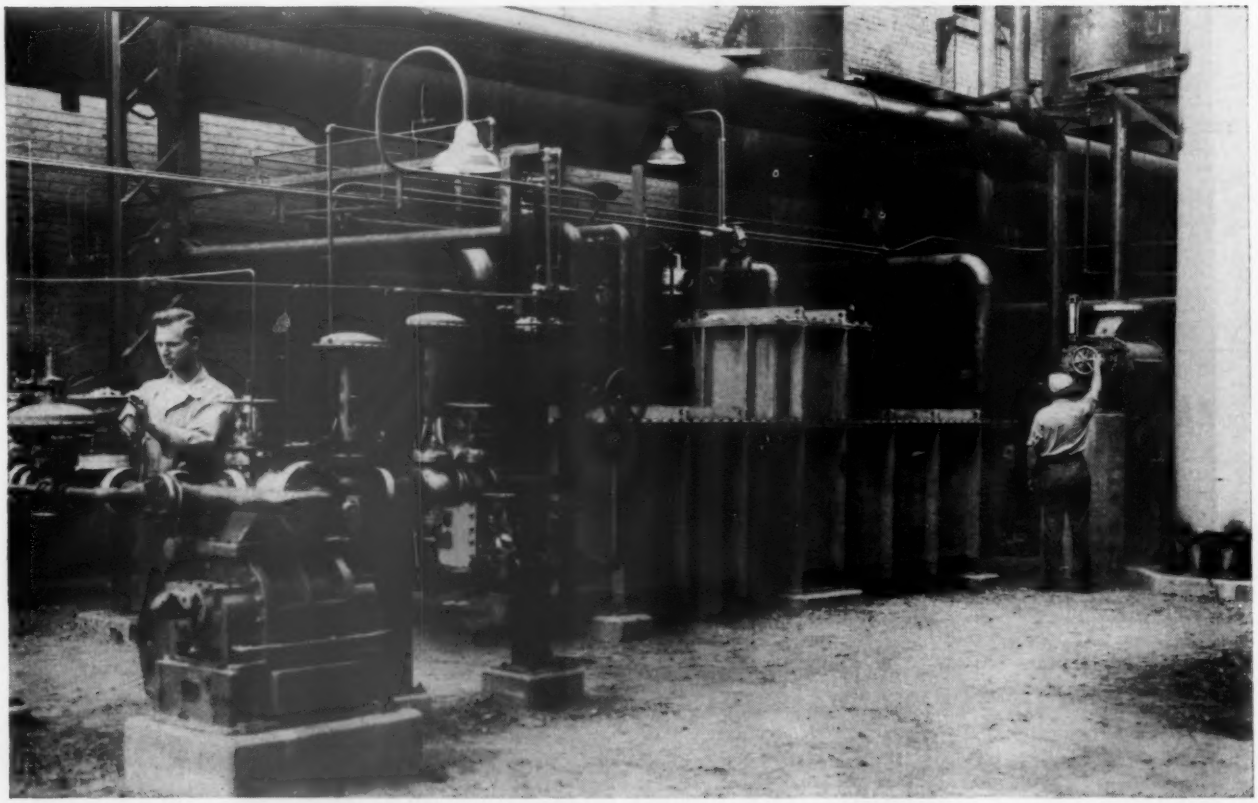
AMERICAN METER CO
MEASUREMENT ENGINEERS

AMERICAN METER COMPANY

or standby service...for peak-load periods...

the Koppers-Hasche Furnace



The Koppers-Hasche Furnace pictured here is now in operation at an eastern utility.

THE Koppers-Hasche Reforming Process and Furnace are the result of 19 years of intensive experimental and development work. The Hasche Furnace is *unique in design*, being a thermal reforming process in which no free lampblack or carbon is produced. Gas is produced by passing a mixture of air and hydrocarbon feed stock continuously through a regenerative furnace.

For utility companies which distribute natural gas—for industrial plants which use natural gas—the Hasche Furnace is ideal for standby service. It is always ready to pinch hit in the event of temporary failure of the natural gas supply. This furnace is also valuable in helping utilities meet peak loads.

Here are some of the principal features of the Hasche Furnace:

INVESTMENT COST IS LOW. Extreme simplicity of process makes initial investment low, per unit of thermal output. Savings are effected not only on furnace cost, but also on auxiliaries. Unit is compact, requiring little ground space. Can be installed outdoors, saving cost of protective housing.

OPERATING COST IS LOW. Units are entirely automatic in operation, requiring minimum of operating labor and supervision. Few moving parts, thus reducing maintenance.

EFFICIENCY IS HIGH. Thermal efficiency is higher than any other gas-producing equipment, ranging upward of 98% with some types of gases.

GAS IS INTERCHANGEABLE. This furnace produces gas that is interchangeable with straight natural gas.

Feel free to write us for further information about the Koppers-Hasche Furnace. Your inquiry will receive prompt attention.

KOPPERS

KOPPERS COMPANY, INC.

Engineering and Construction Division, Pittsburgh 19, Pa.

HITCH YOUR WAGON TO THIS STAR... bryant

See what you get

IN THE SENSATIONAL

bryant "327" unit heater

NOW AVAILABLE IN ALL POPULAR SIZES

FREE FOR THE ASKING! Call your Bryant distributor for your copy of this 20 page fully illustrated book which provides you with much helpful information on specifying, installing and properly locating unit heaters. This comprehensive booklet has been designed to help you.

Sets NEW Standards in...

Quiet Operation . . . NO narrow passages to cause whistling . . . it's open, streamlined—efficiently designed to HUSH the air flowing through.

Compact . . . the "327" installs within inches of ceiling, saving space. It's lighter, easier to handle, easier to install.

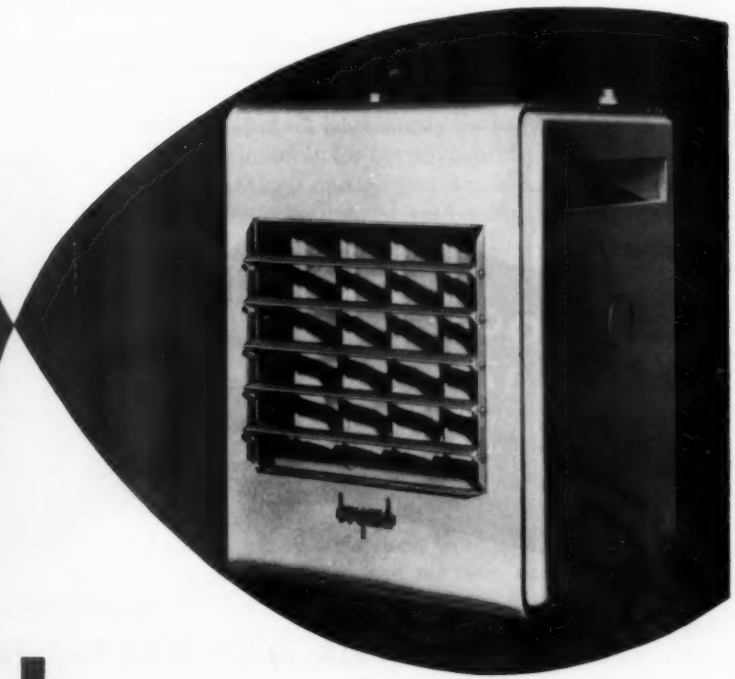
Comfort . . . no cold blasts at start of cycle. Fan won't start until the heat exchanger is warm enough to assure comforting heat.

Long, Trouble-free Performance . . . the "327" retains its high efficiency for life. Efficient Venturi tubes provide longer, trouble-free service, less heat loss up the flue.

Extra-sensitive Controls . . . responsive low-voltage controls mean better, more uniform heat. Safety controls prevent overheating.

Quick, Easy Servicing . . . easy-open access panel at bottom permits cleaning and servicing without removing unit.

Yes, the revolutionary Bryant "327" opens up hundreds of new unit heater sales for you. See your Bryant distributor today or write Bryant Heater Division, Affiliated Gas Equipment, Inc., Dept. 29, 17825 St. Clair Ave., Cleveland 10, Ohio.



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BEST BUY IN...

HEATING
AIR CONDITIONING
WATER HEATING

Which of these Service Regulators *Best Suits Your Needs?*

THE ROCKWELL 107

With one piece body and mounting, plus the ejector principle of automatic boosting.

YOUR CHOICE OF TWO PROVEN TYPES

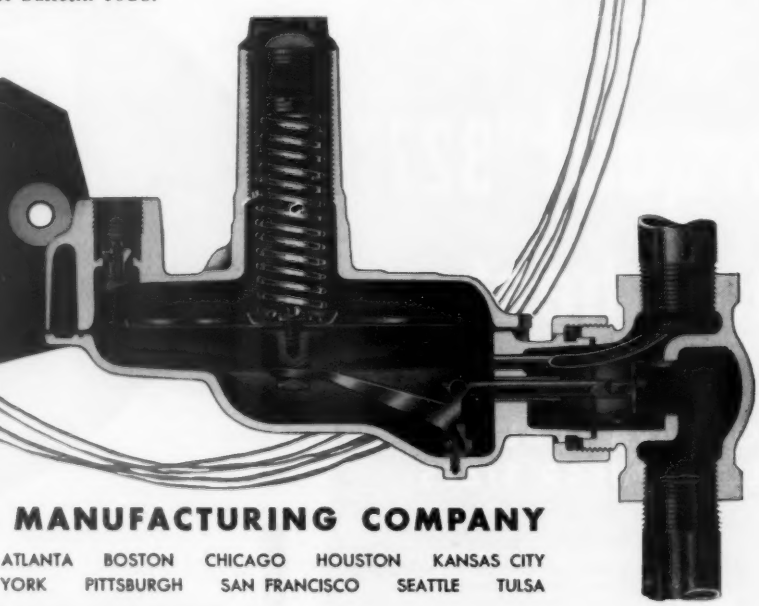
You don't have to compromise on service regulator design when you select from the Rockwell catalog. Here you'll find both the solid body No. 107 and the No. 173 with a separable mounting that's most convenient when installing regulators in cramped quarters. You can have either the ejector ring boosting principle or a venturi tube. And in both regulators you can get a large internal relief valve and a large bottom vent as options. (Regulators with mercury seals can also be obtained.)

Rockwell service regulators are top quality products, carefully engineered and built to give precise control for many years with the least amount of maintenance.

Write today for bulletin 1026.

THE ROCKWELL 173

With detachable mounting and control tube for automatic boosting.



ROCKWELL MANUFACTURING COMPANY

PITTSBURGH 8, PA. ATLANTA BOSTON CHICAGO HOUSTON KANSAS CITY
LOS ANGELES NEW YORK PITTSBURGH SAN FRANCISCO SEATTLE TULSA

ROCKWELL

You Can RELY ON ROCKWELL

for SERVICE REGULATORS

Editorial:

Emergency Prescription

THEY USED TO SAY in the old days that the best way to kill off the aspirations of a presidential candidate was to have him endorsed by William Randolph Hearst. In the trade this was generally referred to as the Kiss of Death and it usually proved to be just that.

Mindful of AMERICAN GAS JOURNAL's controversial status in the otherwise tranquil field of gas industry journalism we are loath to run the risk of grasping in our own lethal embrace the ideas enunciated by Frank C. Smith, new President of the American Gas Association in his address before the 34th annual convention of that body in Atlantic City last month.

In somewhat more elegant diction than we are normally able to command in preparing these fervid and feverish monthly dispatches, Mr. Smith told the gas utility industry that it is "root hog or die" as far as the retention and extension of its base load is concerned, and the field where the rooting has to be done is in the selling of gas appliances.

This is not the first time that a speaker has selected this as a theme for discussion before a gas utility meeting. But the difference between Frank Smith's address and most of the others that we have heard, lay in the fact that he put the first responsibility squarely at the door of gas company top management, which is where it belongs and the only place that it will do any good.

Too many discussions in the past have revolved around what the gas companies *think* the appliance manufacturers ought to do. How they should spend their promotion money; what they should do about new models; requests and even demands for special equipment to meet fancied and largely non-existent "local preferences"; bickering and resentment over changes in sales policies that some manufacturers had to adopt just to assure their survival.

The gas industry is proud of the billion dollars a year that it has been spending since the war to bring gas to new markets and to improve and expand the service in existing markets. But the anticipated retail sales value of the gas appliances that *can* be sold during 1953 is also a billion dollars. The gas utilities, and particularly the gas transmission companies have been howling to high heaven about the necessity of increased rates so that they can continue to attract the new investment capital necessary to continue this expansion. The appliance industry with its investment already made, looks hungrily at the billion dollars its outlets could gross, and wonders if it will be able to just break even.

Frank Smith asks and answers his own rhetorical questions in the only way they can be answered:

> Is a healthy, profitable gas appliance manufacturing industry an absolute essential to the gas utility industry? Yes.
>
> Is gas appliance sales leadership by the utility the absolute essential for a healthy profitable gas appliance manufacturing industry? Yes.
>
> Is appliance sales leadership the direct inescapable responsibility of the gas utility industry? Yes.

But the big question, and the one no speaker can answer for any company but his own is the key to the whole problem of gas industry survival. Will the utilities' management, beginning at the top, see to it that they maintain their markets and survive?

We have seen many AGA presidents come and go. We have seen some of them drift quietly through a term in office without so much as ripple to indicate either course or direction being taken in association affairs. We have seen vigorous and enthusiastic starters who wound up as weary purveyors of polite platitudes ghost-written for them by the competent wordsmiths of the AGA staff. Fortunately we have seen a few who came in with ideas for the advancement of the industry and who fought and gouged and sweated those ideas through to realization. In our book the new incumbent belongs among the fighters.

We are of the firm conviction that Frank Smith's speech at Atlantic City will become the keynote address of his administration as association president, setting the pace and pattern that the entire gas utility industry will follow. And we are certain beyond peradventure that once the gas utilities do set the pace, there will be no need for further concern about an ailing appliance industry. The normal sentimental attachment that any manufacturer has for black ink instead of red on his balance sheet will take care of that.

But time is short, and no man, not even a Texan, can do it all alone. The new AGA president has diagnosed the case and in a large measure written the prescription. It is now up to his fellow executive in the gas industry to start gulping down the pills, and without any more sugar coating.

Elliott Taylor

United Front on Merchandising Appliances Foretold at AGA Convention

THE direction of primary future emphasis by the gas utility industry was indicated sharply but realistically by Frank C. Smith, president, Houston Natural Gas Company, in his keynoting address to the American Gas Association convention, late last month. He asked utility managements if they were going to "see to it that we maintain our markets and survive."

The need for what amounts to cohesive planning and sales action by the utilities and the gas appliance manufacturers was stated, emphasized and illustrated for the capacity audience in the auditorium during a general session.

Comments by gas appliance manufacturing executives, at the conclusion of Mr. Smith's remarks, amounted to new applause for his thinking and straightforward expression but maintained a wary silence on expectations of early general rejuvenation of utility sales emphasis.

[Mr. Smith's address is reported in some detail on page 43.]

The thirty-fourth AGA convention established a record for attendance with more than 8,000 delegates and guests from utilities, transmission companies, producers, appliance manufacturers and dealers. The four-day convention offered a varied program with substantial opportunities for delegates with specialized interests to hear and participate in well-informed discussions of matters ranging from established practices to a look toward the time when a substitute natural gas will be both necessary and economically feasible.

The financial status of AGA was presented to the membership by Edward F. Barrett, president, Long Island Lighting Company, and treasurer of the Association.

Immediately thereafter, Charles E. Bennett, president, Manufacturers Light and Heat Company, and outgoing president of AGA, reviewed briefly the current status of the industry, its points of progress and predicted that its spectacular advance would continue.

A general discussion of current labor trends and problems was presented by Sumner H. Slichter, Lamont professor of Harvard University.

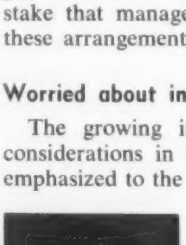
"It is an important shortcoming in management's approach to industrial relations, I think," Professor Slichter commented, "that top executives do not seem to have carefully analyzed the basic policies of unions nor to have gained a clear understanding of the stake that management has in making these arrangements work."

THE GAVEL PASSES

Charles E. Bennett, right, outgoing president of American Gas Association, passes the symbol of office to Frank C. Smith, the new president, during the proceedings at the AGA convention.

Worried about industry safety record

The growing importance of safety considerations in the gas industry was emphasized to the convention in a presentation prepared by Earl H. Eacker, president, Boston Consolidated Gas Company, and now first vice president of AGA.



Earl H. Eacker
Elected first vice president at convention.

Mr. Eacker traced the history of the gas industry's safety-consciousness by noting that as early as 1903 specifications for gas ranges and other domestic equipment were developed and how, through the years, the program has enlarged to the point of having nationally acceptable specifications, requirements and codes.

He recognized, with a question as to why, in a list of forty industries, the gas industry stands thirty-second in accident-frequency and twenty-fourth in accident-severity.

His presentation contrasted performances among gas companies. As an illustration of improvement in safety record he cited Washington Gas Light Company which, in a period of five years, has reduced the frequencies rate from 30-31 per-million-man-hours to 6-7 per-million-man-hours.

"I am worried," he said, "because I fear that a high frequency rate is an indication that workers are not fully safety conscious and that serious accidents are in the breeding.

"Your Association's executive safety committee has as the aim of our industry . . . a vast improvement in the industry's safety record, not just to improve the record statistics but to benefit its employees, to customers, the general public and its stockholders."

With well-reiterated emphasis, Louis Ruthenburg, chairman, Servel, Inc., and outgoing president of Gas Appliance Manufacturers' Association, gave the appliance manufacturer's viewpoint on the need for planned marketing programs that would assure effective appliance selling.

He described "insured service" as a most effective selling tool for gas utilities. He explained that insured service means "an addition to the gas rate which is a premium paid by all residential consumers for insuring comprehensive appliance service without direct charge.

"Such service policy, now followed by many gas utilities, has great advantages to the utility and its customers. It precludes maladjustments of the appliances by incompetent agencies. It avoids neglect of appliances. . . . It keeps the utility aware of appliance quality requirements. It reduces sales resistance to the minimum. It fosters good public relations."

In his conclusion, Mr. Ruthenburg referred to the forthcoming recommendations by the AGA-GAMA liaison committees that have been at work over the past 6 months and said that "these will be the most comprehensive conclusions and recommendations ever developed by the gas and gas appliance industries. They cover, not a single operation, but provide the basis for an expanded and continuing appliance selling program.

"Resolve to apply them constructively and aggressively," he urged, "with all the money and energy that may be needed.

"Sale of gas appliances and the strength of the gas utilities' basic residential load are completely interdependent. Gas appliance manufacturers cannot serve the gas utilities efficiently if they must continue to produce gas appliances at present volume."

The relationship between the gas producer and the gas consumer was pictured for the convention by E. I. Thompson, executive vice president, Texas Independent Producers and Royalty Owners Association.

Mr. Thompson said, ". . . the most important single incentive to the conservation of natural gas is a proper market with an adequate price . . . it is terribly unfortunate that the consumers of natural gas have not understood that the primary interest should be the maximum efficient production of that commodity . . . the time will come when consumers will realize that their goal should be maximum supply rather than minimum price."

In a relatively technical presentation to a general session, Gustav Egloff, Universal Oil Products Company, discussed the place of natural gas in the present and in the future.

"Unless unforeseen technological developments take place," Dr. Egloff said, "natural gas will continue to be a more economical source of gas than oil or solid fuels. Research on the production of gas from solid fuels is sufficiently promising to warrant continuation so that the gas industry can meet any crisis that may arise in the distant future."

The gas utilities were urged to maintain and enhance earnings in every way possible to retain support of investors, by Tom Walker, vice president, Irving Trust Company. He said this could be done through good service, economy in financing and operation, and by obtaining fair and compensatory rates. The fact that gas utilities were doing these things must be made known to the investing community, he said.

"The premiums which we charge for insurance must do three things," H. P. Stellwagen, executive vice president, Indemnity Insurance Company of North America, told a general sessions audience. "They must cover the losses produced by the risks assumed, they must pay our expenses and they must yield a profit."

Later, he coupled that basic principle with the principle that "reinsurance is essential to the underwriting of risks which are limited in number and which are characterized by heavy loss potentials.

He said that because of the failure of these principles to operate in the case of the gas business the current restriction of the American market for excess liability insurance was brought about.

New AGA officers, directors, chairmen

The slate of Association officers, directors, section and committee chairmen, presented by the General Nominating Committee was elected. They include:

President: Frank C. Smith, president, Houston Natural Gas Corp.

First vice president: Earl H. Eacker, president, Boston Consolidated Gas Co.

Second vice president: F. M. Banks, president and general manager, Southern California Gas Co., Los Angeles.

Treasurer: Edward F. Barrett, president, Long Island Lighting Co., Mineola, New York.

Directors:

E. R. Acker, president, Central Hudson Gas & Electric Corp., Poughkeepsie, New York.

L. B. Bonnett, vice president, Consolidated Edison Co. of New York, Inc.

Channing W. Wilson, left, Consolidated Gas Electric Light and Power Co., Baltimore, incoming chairman of the operating section, with H. Bruce Andersen, The Philadelphia Gas Works Co., the outgoing chairman.

F. M. Banks, the new second vice president of AGA, and president, Southern California Gas Co., with H. G. Dillin, vice president in charge of sales, San Diego Gas and Electric Co.

Everett J. Boothby, president, Washington Gas Light Co.

Dudley B. W. Brown, president, Milwaukee Gas Light Co.

A. W. Conover, president, Equitable Gas Co., Pittsburgh.

N. Henry Gellert, president, Seattle Gas Co.

Lyle C. Harvey, president and general manager, Affiliated Gas Equipment, Inc., Cleveland.

Frederic O. Hess, president, Selas Corporation of America, Philadelphia.

Robert A. Hornby, executive vice president, Pacific Lighting Corp., San Francisco.

J. K. Horton, president, Pacific Public Service Co., San Francisco.

Paul Kayser, president, El Paso Natural Gas Co., Houston.

James F. Oates, Jr., chairman, The Peoples Gas Light & Coke Co., Chicago.

William T. Stevenson, president, Western Kentucky Gas Co., Owensboro, Kentucky.

R. G. Taber, president, Atlanta Gas Light Co.

George E. Whitwell, vice president in charge of sales, Philadelphia Electric Co.

Charles G. Young, president, Springfield Gas Light Co., Springfield, Mass.

These chairmen of sections were elected:

Accounting: Bernard S. Rodey, Jr., assistant secretary, Consolidated Edison Co. of New York, Inc.

Industrial and commercial: Terry Hart, general sales manager, Nashville Gas Co.

Residential: R. J. Vandagriff, general sales manager, Laclede Gas Co., St. Louis.

Operating: Channing W. Wilson, research chemist, Consolidated Gas Electric Light & Power Co. of Baltimore.

Manufacturers: Gordon Lefebvre, president, The Cooper-Bessemer Corp., Mt. Vernon, Ohio.

Our Natural Gas Supply—When Will We Need Substitutes and How Will We Get Them?

by Charles F. de Mey
Vice President and Chief Engineer
Columbia Gas System Service Corporation

TO those of us who have been a part of the natural gas industry over a period of twenty years or more, the developing and nurturing of our gas supply is probably the most important single activity among all of the various problems of running a natural gas public utility. So today, when we are beginning to think of supplementing our natural gas supply, very little that is new has been added to the picture and as I look upon it we are merely fulfilling our obligation to our customers by assuring them of a continued adequate supply of gas of the kind and quality which can be utilized efficiently in their existing gas consuming equipment.

With this in mind some of our industry members have undertaken preliminary reviews of the situation and in my company we have taken a look at the problem of producing natural gas substitutes from coal by various methods.

We have a fairly comprehensive picture of the gas supply situation and it looks very good. However, we believe that the continued study of developments in the fields of coal gasification and gas synthesis should be a regular part of our studies.

The need for further research to settle the many questions now remaining without adequate answers is evident. The gas industry is equipped and can afford to undertake such research on these subjects and it would seem to be good sense for projects relating to coal gasification and the synthesis of a substitute natural gas to be undertaken in the future on a larger scale than heretofore.

The "substitute gas" which will be discussed here is not for peak shaving or other short term use but is for the supplementing or even complete replacement of natural gas on a permanent basis if conditions so require. The relatively high production investment necessary per unit of capacity precludes operations at low load factors, thus the substitute gas supply is somewhat comparable in its economics to present long transmission line operation.

It is quite evident that from the historical evidence available we cannot at this time reach any conclusion as to the approximate date when natural gas will be depleted to the point that substitutes will be required in significantly large volumes.

Charles F. de Mey, at AGA convention, as he made the presentation from which this article was adapted.

The record of the last 25 years shows that our industry has maintained a proved reserve back-log consistent with its market requirements. Even if we could accurately estimate our country's needs for natural gas during the next 25 or 30 years we are not, at the present time, able to forecast with any degree of certainty when substitution of a synthetic natural gas will become necessary.

Although actual requirements may be in excess of the estimates which have been made by companies changing over from manufactured to natural gas, it would appear that some of the optimistic estimates of the last few years may require revision downward. Those of us who have lived with the house heating and industrial situation through the '30s realize how sensitive these markets can be as rates approach competitive fuel costs. Therefore, our continued efforts to bring the presently inadequate domestic and industrial rates up to a level approximating a more rational relationship with other fuels may result in lower ultimate market saturations than some of us have been anticipating during the past few years.

When it comes to estimating the date when the supplementing of our natural gas supplies will commence, in view of the number of imponderables which would require evaluation, I do not think that we can anticipate by much more than five years the need for, or the economic feasibility of, supplementing existing supplies of natural gas with a substitute product.

There are too many variables which must be considered and which are not under the control of our industry.

When the ratio of proved reserves to annual production begins to decline, the industry will keep pace with the demand for gas by stepping up research and experimentation in the synthetic or substitute gas field. A sound basis for future development is now being laid, but since there is a relatively small need at present and in the foreseeable future progress has been slow.

Another indication that the era of substitute natural gas may be approaching will be the increased cost of gas delivered to our distribution systems by the pipeline companies. When a natural gas substitute can compete with straight natural gas, the substitute problem will be solved automatically from an economic standpoint and the reserve ratio will become somewhat academic.

When such indicators appear to us, I believe it will be possible to anticipate the need or desirability of producing large volumes of a substitute gas at least five years prior to the actual need of the gas by our customers.

Judging by present developments, I believe that the smallest plant which would be economically practical would have an output of some 100 billion Btu per day. It would probably take almost five years to design such a plant and get it on stream even if we will have decided on its type and location. Because of this time lag in planning, erecting and putting into operation a plant for making substitute gas, it seems advisable that we be as nearly ready as possible to proceed when the evidence is at hand that such action is required.

We cannot say today which of the various processes will eventually prove best—that is why research is needed. Some engineers believe that gas made from oil will come into the picture at one place or another according to the price of suitable oil and proximity to the source of supply of such oil.

Eventually coal must be the major raw material hence it is natural to consider the various procedures suggested for (a) making water gas (mixtures of hydrogen and carbon monoxide) from solid fuels of low cost, and (b) converting the water gas to a rich gas by contacting it with a suitable catalyst at elevated temperatures and pressures. A number of different methods for generating the water gas are now under investigation, and likewise various means for contacting the water gas with catalysts have been studied.

(Continued on page 38)

Radiant Gas-Fired Processing Equipment Makes Superior Quality Oil Well Casign

THE precise controllability of gas and gas combustion equipment is credited with an important processing improvement in the manufacture of high-strength oil well casing by Spang-Chalfant division of The National Supply Company.

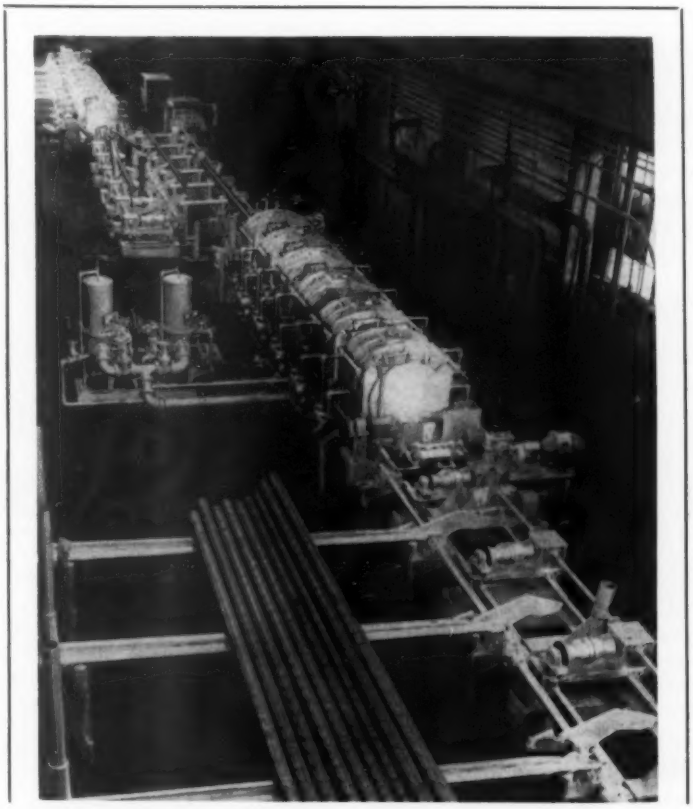
American Petroleum Institute's specifications for oil well casing, designated as Grade N-80, usually requires the use of normalized-and-drawn high manganese-molybdenum steel. A new process has just been revealed publicly, after five years of operating and production experience, in which gas and gas equipment have made it possible to substitute plain carbon steel, thereby saving 150 tons of molybdenum and 750 tons of manganese in the production of more than 80,000 tons of casing.

Under the restrictions on the use of molybdenum and the effort to conserve all alloying elements, this development for the steel industry has not only saved those materials but speeded production, reduced costs and, of great technological importance, has produced a product that is superior to the one produced previously.

The equipment in which Spang-Chalfant processes oil well casing is a continuous straight-through line of gas-fired radiant furnaces, designed and constructed by Selas Corporation of America, Philadelphia.

The line consists of:

1. Twelve high thermal release radiant gas-fired furnaces arranged in two sections of six furnaces each. The first or high-heat section heats the pipe to the required quenching temperature, and the second section performs the draw or tempering.
2. Eight combustion controllers for preparing pre-mixed air-and-gas which is delivered under pressure to the radiant burners.
3. Temperature control and recording equipment for each of the twelve furnaces, plus a recording radiation pyrometer that furnishes a continuous record of the pipe quenching temperature.
4. An annular orifice quench head with pumping and filtering equipment.
5. Conveyers and handling tables equipped with electrical, mechanical and pneumatic devices that are necessary for the automatic movement of the pipe through the high-heat furnaces, quench head and draw furnaces.



The overall view of the continuous straight-through radiant gas-fired heat processing line installed in the Ambridge, Pennsylvania, plant of Spang-Chalfant Division, The National Supply Company. Casing is delivered mechanically from the table, foreground, to the conveyer, right, and then proceeds directly to the first set of six furnaces. After quenching and draining, it proceeds through the second set of furnaces, top, left. This equipment utilizes gas in direct-fired radiant equipment, designed and manufactured by Selas Corporation of America, and operates under precise temperature-and-time control. Photo: The National Supply Company

In operation, the casing is placed on a pipe table from which it is delivered mechanically to the first set of six furnaces where it is heated to approximately 1600°F. As it emerges from the last furnace in this section it passes through the annular orifice quench head where it is water quenched cold.

An intermediate conveyer carries the casing to the second set of furnaces where it is tilted and drained of any remaining water for a definite time interval.

The casing enters the second set of furnaces for drawing or tempering and is raised to 1100° or 1150°F, depending upon the chemistry of the metal.

When the casing emerges from the second set of furnaces, it goes directly to the final stages of preparation for shipment.

All sections of the conveyers have individual speed adjustments coordinated with an overall speed control that will raise or lower the rate of operation as required.

The individual conveyer speed adjustments permit different speeds at different points along the line.

The tail end of the one section of casing going through the quench head must be approximately 18 inches in front of the head end of the following casing to prevent water from entering the casing which is still within the heating chambers. However, in the draw furnaces, casing sections must be butted together

(Continued on page 32)

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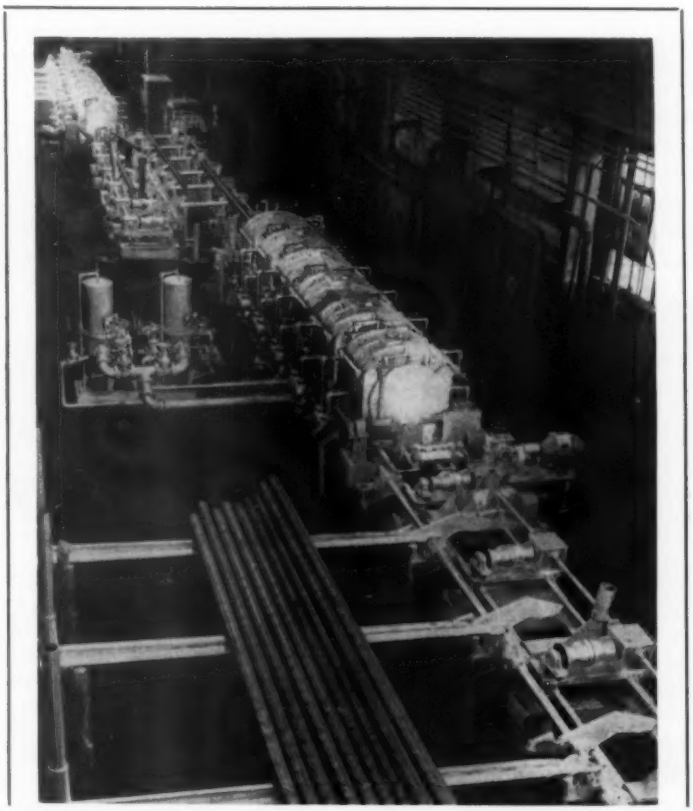

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Photo: The National Supply Company

In operation, the casing is placed on a pipe table from which it is delivered mechanically to the first set of six furnaces where it is heated to approximately 1600°F. As it emerges from the last furnace in this section it passes through the annular orifice quench head where it is water quenched cold.

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(Continued on page 32)

Safety in Utility LP Gas Plants Depends on Basic Engineering and Sound Construction

PART TWO

by William H. Kramer, Jr.
New York District Manager, Sales
Phillips Petroleum Company

This is the second of two parts of an article by William H. Kramer, Jr. The first part appeared in the October issue of American Gas Journal.

PREPARATIONS for safe installations of liquefied petroleum gas plants include the selection of equipment and materials that have been tested and approved for characteristically-safe performance. Some of the items in this group are excess flow valves, liquid level gauges, lubricants, pipe and fittings, cathodic protection, grounding systems and reflecting paints.

William H. Kramer, Jr.

Excess flow valves essential

All storage tank connections, excepting relief valves and volume gauges, should be protected by excess flow valves or back-flow check valves, as approved by Underwriters' Laboratories.

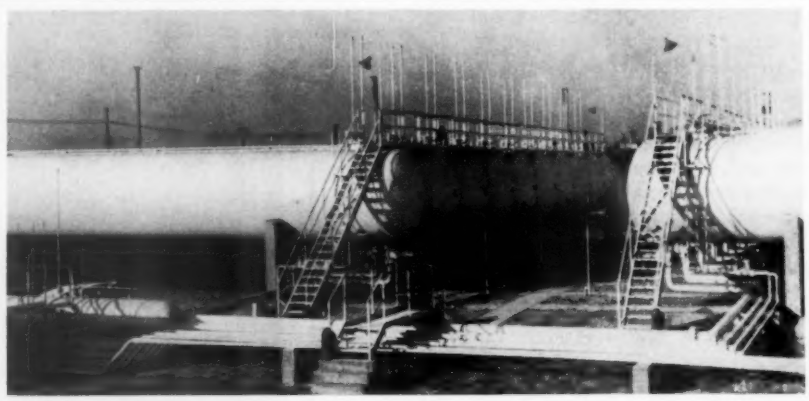
Excess flow valves prevent the hazards which result from LP gas that has escaped inadvertently, by automatically shutting off the flow, to the atmosphere, of liquid or gas when there is a line break or other mishap.

Excess flow valves are to be located either inside the tank or at an external point where the line enters the tank. In the latter case, the valve is to be installed so that strains will not cause breaks between the tank and the flow valve.

All branch lines, particularly the long liquid lines, should be protected by these excess flow valves or some type of automatic shut-off valve that can be controlled remotely.

The selection of these automatic protection devices depends upon local and individual conditions.

All automatic devices, certainly including excess flow valves, require periodic testing. The flow valves should be tested as part of a regular testing program, but not less often than once a year.



This multiple-tank installation is regarded as a good example of providing adequate swings in the piping.

Liquid fill connections on tanks should be provided with back-pressure check valves which permit flow in one direction only, to the tank. This is added protection in case of a line break between the tank and the unloading rack.

Liquid level gauges

The liquid level in tanks should be determined by either a magnetic gauge, rotary gauge or slip tube gauge of approved type. Tanks that are equipped with magnetic gauges should have other means to determine the maximum liquid filling height. This can be a slip tube gauge or a test connection located at the maximum filling height of the tank.

Shut-off valves that are on or off the storage tank must have the approval of the Underwriters' Laboratories. A list of approved primary or positive shut-off valves was issued by the Laboratories in November, 1951.

Metal-to-metal seat gate valves are suitable only for installation in branch or by-pass lines where positive shut-off is not essential.

The most commonly used type of primary shut-off valve for LP gas service is a bronze angle or globe valve with a resilient seat that is impervious to the solvent action of LP gas. This and other types of UL-approved valves have given trouble free service over periods of years.

The lubricated plug valve is another type that is used frequently by the gas industry for its LP gas facilities, and a number of them are approved by UL.

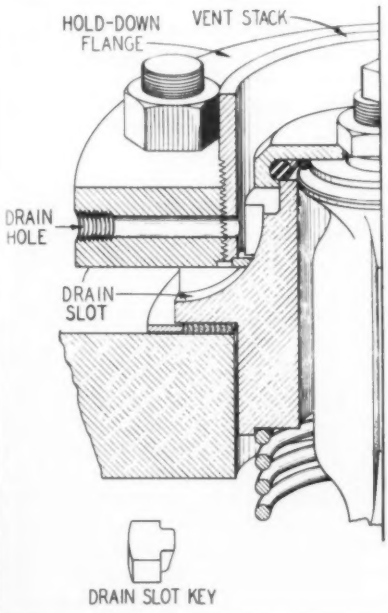
Lubricants to withstand LP

It seems appropriate to give a word of caution on the lubricated valve. The lubricant or grease in this valve must be suitable for LP gas; otherwise the seal will be dissolved and the valve will leak. This should be ascertained before installing the valve, and the maintenance program should include lubrication with the correct grease for LP gas.

A new type of valve was approved recently for positive shut-off service. It is single or double seated, sliding disc, lapped metal-to-metal seat.

Another interesting and recent development in valves is the automatic-closing internal type, which is opened only by hydraulic pressure imposed on the system by manual or automatic operating mechanism.

The hydraulic system is provided with fuse plugs and with pressure relief valves that are remote from the operating mechanism and serve as secondary control for closing valves in an emergency. [See "Safety is Emphatic in Design and Operation of Georgia Peak Shaving Plant," by G. J. Tankersley, AMERICAN GAS JOURNAL, June 1952.] These valves are used inside storage tanks in the same manner as excess flow valves.



This is a suggested method for inserting a drain slot key to plug the drain hole and to pipe any discharge from relief valves to safe locations.

The piping in an LP gas plant can determine the difference between a safe plant and a hazardous plant. Pipe that is of the proper type and follows specifications is, in fact, the first requirement.

Piping recommendations

All piping should be of the standard weight from schedule 40, excepting connections that are made directly to the tank and those, for extra strength, should be from schedule 80.

Seamless pipe is preferred over any welded pipe for LP gas service. The quality of the steel is better and there are no weld weaknesses. Of course, the seamless pipe selected should be of a weldable steel such as ASTM A-106, grade B, or ASTM A-53, grade B.

Electric resistance welded pipe is second choice but occasionally reveals material and weld failures.

Lap welded pipe has a primary weakness in the quality of the steel, the lack of control during welding and the nature of the resulting welds.

Butt welded pipe is rated lowest because of the inherent weakness at the weld and brittleness in the Bessemer steel commonly used.

Although LP gas is handled at atmospheric temperatures, it is essential to consider the increased temperature due to steam heat exchangers, compressors and similar equipment; also to the lowered temperatures due to expansion of the gas. Extremely low temperatures and high stresses occur when liquid lines are blown down to make repairs or alterations. Throttling across a valve can give the same effect. High temperatures and stresses may also occur when purging lines with steam.

Preferred fittings

If screwed fittings are to be used in LP gas piping, the selection of the proper type and the specifications of the fittings are just as important as the pipe used.

Forged steel fittings are preferable to the 300 psi malleable iron fittings because of inherent weaknesses of cast metals. American Standard malleable fitting, sometimes called extra heavy malleable, is the minimum acceptable. In that connection it is essential to verify the pressure rating. Stamped on these malleable fittings is the identification, "300 M. I." *Cast iron fittings must not be used.*

Screwed piping has been the general practice in the ordinary sized LP gas plant because of the availability of materials and the relatively non-technical skill that is required to do an acceptable job in allowing for expansion, contraction and settling by using elbows as swing joints. However, it is recognized that screwed fittings increase the possibility of leaks; cast fittings can have sand holes and thermal cracks; and threading removes much of the fitting thickness and pipe wall to leave a relatively weaker joint.

All flanges whether screwed or welded should be of forged steel and conform to ASA standards for 300 psig.

Packed sleeve couplings are not recommended for LP gas lines. Recent tests were conducted by Factory Mutual Laboratories, on four types of gaskets are: synthetic rubber, compressed asbestos, spiral wound metal-asbestos and aluminum. The tests showed that aluminum O rings and spiral-wound metal-asbestos are recommended for their ability to withstand exposure fires.

As in the case of all other piping, tightness in the threads of LP pipe assemblies must be insured by some form of compound. In the case of LP gas piping, the joint compound must be impervious to the solvent action of propane. Some of the compounds that are recommended for use include light grade Tite Seal, Stalastic and Pipetite-Stick.

Welded systems favored

For permanently leak proof piping, welded systems have gained the almost universal acceptance of the gas industry. It requires little or no maintenance during the life of the system and the welded fittings from a continuous metal structure that produces joints as strong or stronger than the pipe itself. Forged steel welded fittings such as those supplied to ASTM specifications A-181 and A-234, are recommended.

To gain all the advantages of a welded piping job, experienced designers must plan the work that is to be done by qualified welders, with equally qualified supervisors and inspectors to insure the work.

The ASA code for pressure piping (B31.1) states that "the contractor shall be responsible for the quality of the welding done by his organization, and shall conduct tests not only of the welding procedure . . . but also of the welding operators. It is assumed that the contractor performing the welding has an organization familiar with this code and capable of designing, engineering and supervising welded piping construction."

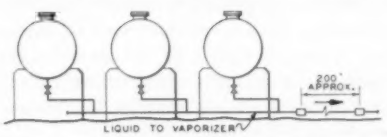
Installation of plant lines

As the size of an LP gas storage area and its capacity increase, the problem of designing piping for an LP gas plant is magnified due to the increasing necessity for allowances for contraction, expansion, settling and surging in the piping as well as in the storage tanks. There are three general methods of installing lines: underground, overhead or on sleepers.

When pipes are placed underground, no supports are necessary, the plant yard is not cluttered and danger of damage by external forces has been reduced.

The disadvantages are that the underground lines must be coated to protect against corrosion, and the lines must be encased under highways and railroads.

Overhead lines have the advantages of being easily observed and maintained. They can be swung to allow for expansion and contraction. Of course, overhead supports are an item of expense and their design must consider equipment that moves about the plant.



One method of protecting liquid lines by excess flow valves or automatic shut-off valves is shown above.

Lines that are on either low supports or sleepers can be maintained easily, and their installation cost is low.

The possibility of damage from external forces is greater and the lines may create difficulties with respect to movable equipment.

It seems quite obvious, from the foregoing considerations, that the method of

(Continued on page 32)

What Will Happen When War-Spending Reaches Peak and Levels Off?

by John F. Falvey

Financial Editor

UNCERTAINTY is besetting both economists and investors as each group strives to lift aside the curtain to see just what the future might hold in store.

John F. Falvey

Chief cause of the uncertainty is the question of what might happen to the economy of the country when war-spending reaches its peak and then levels off, as generally expected, about late-Summer or early-Fall of 1953. Government outlays for war and foreign aid currently are running at a $52 billion annual rate and are expected to go to a peak of around $60 to $65 billion next June or July. That compares with $50 billion in the initial three months of 1952 and with $48 billion in the steel-strike-affected second quarter.

As indicated in the fluctuating course which the stock market recently has been following, both as to the trend of prices and volume, there is a considerable cleavage of opinion even among those who make the stock market and investments their business.

Those among them who feel that corporate profits and quotations for common stocks could be sensitive to developments, point out that labor costs are going to be less flexible than ever, break-even points for industry as a whole are much higher and numerous unnecessary expenses have been incurred over recent years which would be difficult of curtailment or elimination.

The argument is advanced against this that cushions are provided in the present extraordinarily high level of taxation which might be reduced in the event of business recession, new efficient machinery and equipment places industry in a better position to weather adversity and more conservative inventory accounting practices alleviate possible losses on this score.

With all the pessimism which pervades some quarters, however, it might be mentioned that the AMERICAN GAS JOURNAL index currently is little changed, on the average, from what it was several months ago and a number of points above the level of a year ago. This despite the jitters which have been witnessed in natural gas equities due to recent harsh decisions of Federal Power Commission.

It is significant that, on balance, the expectation is for a well-maintained level of general business for at least the next seven to ten months and for only a moderate set-back on reduction of armament and foreign aid as the prospective cushions absorb most of the shock of the anticipated curtailment in government spending.

"Consumer spending is the most important single item in the business picture," big Prudential Insurance Company of America said recently as it predicted an increase of some $14 billion in spending during 1953, which would lead to a record-breaking "gross national product" of $360 billion.

Despite recent slump, corporate dividend payments at last report were continuing a shade above last year's level and for the first nine months of 1952 were four per cent above the identical 1951 period. Utility companies recently have been making a better than average showing in this important respect. This factor, together with the stable nature of the industry, should make it easier for the utilities to market additional common shares as might be necessary to finance expansion.

An increasing number of companies in the industry also have covered their financing needs for most of 1953 through bank loan accommodation at favorable interest rates. And those who have not done so as yet conceivably might expect to arrange temporary financing at a more advantageous interest rate than many folks thought possible *a few short weeks ago*. This is because the banks, as a group, have not been able to see eye-to-eye in seeking an increase in the prime commercial borrowing rate. Those opposed to a change are reported to exceed the number that favor raising the rate. In taking this view, they hold to the theory that a relatively good rate, such as three per cent, if it could be held stable for a substantial period of time,

(Continued on page 39)

INDEX OF YIELDS : SELECTED UTILITIES STOCKS

	Oct. 1952	Sept. 1952	Aug. 1952	July 1952	June 1952	May 1952	Apr. 1952	Mar. 1952	Feb. 1952	Jan. 1952	Dec. 1951	Nov. 1951
Natural Gas Transmission Companies	4.48%	4.44%	4.10%	4.01%	3.98%	4.05%	4.08%	4.03%	4.36%	4.32%	4.50%	4.51%
Natural Gas Transmission & Distribution Companies	5.47	5.45	5.30	5.26	5.28	5.32	5.34	5.14	5.29	5.17	5.33	5.30
Manufactured & Mixed Gas Companies	5.04	4.80	4.70	4.89	4.84	5.06	5.13	4.99	5.18	5.05	5.25	5.36
Class "A" Electric Companies	5.40	5.39	5.40	5.49	5.60	5.54	5.65	5.51	5.61	5.53	5.80	5.78
Class "B" Electric Companies	5.47	5.42	5.46	5.51	5.55	5.57	5.61	5.48	5.70	5.64	5.76	5.82

This is a straight arithmetical index of comparative yields obtainable on a selected group of gas and electric utility industry common stocks.

The companies comprising this index have been selected by the AMERICAN GAS JOURNAL as providing a representative cross-section of each industry, from the standpoint of geographical diversification and of the relative importance of the individual companies in their areas.

No effort has been made to weight the average to give effect to changes in capitalization or in dividend rates because the yields afforded on the issues reflect such changes. The index is designed to show the rate of return and not necessarily market movements on the stocks comprising it.

This index is compiled from: natural gas transmission companies, 5; natural gas transmission and distribution companies, 5; manufactured and mixed gas companies, 4; class "A" electric companies, 4; class "B" electric companies, 5.

Law Establishes Written Contract Provisions as Superior

by Leo T. Parker
Attorney at Law
Cincinnati, Ohio

SMALL TYPE in contracts has been the butt of many a jest. For one party to a contract, the small type can be something but a jest and there have been sufficient legal precedents to warrant reconsiderations of contract terms and the manner in which they are presented.

Printed contracts are in the status of being superseded to whatever extent is indicated by specific typewritten or handwritten addenda, when the printed conditions are in conflict with those in the addenda.

Recent court decisions, based on contract law, have reemphasized the importance to all gas utilities, appliance dealers and contractors of careful examination of contracts to which they are a party in order to assure consistency and appropriate protection. This applies equally to contracts in which gas industry elements are the buyers *or* the sellers.

Indeed, contradictions or modifications of a contract, even if they are verbal but thoroughly substantiated, prove to be superior to printed contract provisions.

The law is well-established that where a contract is printed, typewritten, or penwritten, the pen-written clauses always prevail over the printed and typewritten portions, and that the typewritten parts supersede the printed portions.

For illustration, in the leading case of White, 86 S.E. 671, a higher court said, "There is a well established rule that where, as in the use of printed forms, a contract is partly printed and partly written, the writing will prevail if there is conflict between the printing and writing. And the same is true, where the contract is partly printed and partly typewritten. The written or typewritten part always will prevail. . . ."

In arriving at a legal interpretation of a written or printed contract, the courts examine the whole instrument in view of ascertaining and carrying into effect the original purposes and intentions the contracting parties had when the contract was signed. Moreover, the courts *never* presume that contracting parties intended to insert in their contract a written provision wholly incompatable and irreconcilable with printed clauses. In fact, the courts always decide otherwise.

Therefore, it is a rule of law that typewritten portions of a contract have greater weight than the printed parts. This rule is based upon the fact that greater attention has been bestowed by the contracting parties upon the typewritten parts than upon the printed clauses. Furthermore, the courts conclude that pen or handwritten portions of a contract are more important and deserve greater consideration than typewritten clauses.

In Riedel 223 Fed. 704, a United States court, in commenting on this point of the law, commended, "It scarcely needs the citation of authority to support the well established rule that the printed portions of a contract, when repugnant, must be subordinated to those which are written and that the latter are presumed, from the circumstances of their special and deliberate insertion by the parties, to embrace the real intent and meaning."

Hence, it is certain that inserted typewritten or pen-written clauses in a contract decide the rights and liabilities of the contracting parties upon the typethe printed body of the contract.

Custom is important

All courts construe contracts to mean exactly what the contracting parties *intended* at the time the contract was signed. Hence, "old customs" between the contracting parties automatically become a part of the contract.

In one case, it was shown that a gas company signed a contract to purchase a large quantity of steel pipe which the seller agreed to deliver on a specified date. The testimony showed that in the past the gas company had contracted for purchase of pipe with this seller, *always* with the knowledge of the seller's custom that orders on contracts for pipe would be delivered *only upon issuance* of a certificate of convenience and necessity by Federal Power Commission.

In subsequent litigation the higher court held that the seller could not be held liable in damages for refusal to deliver the pipe, when no certificate of convenience and necessity was issued by the Commission. The court said, "We hold that appellant (purchaser) contracted with knowledge of and was absolutely bound by the custom. . . ."

Ambiguous contract

Considerable discussion has arisen from time to time over the question: "If a contract is ambiguous, what are the legal rights of the contracting parties?"

According to a late higher court decision, a written or printed contract, if ambiguous, always is construed most strongly *against the party who wrote it.*

For example, in Skelly v. Peterson, 43 N.W. (2d) 449, a gas company sued a former distributor of its gas and appliances. The basis of its suit was a printed contract prepared by the gas company. This court held, "If it is ambiguous, it appears from the record that both the distributor and consumer agreements were executed upon printed blanks furnished by the plaintiff (gas company), and it is a recognized rule of law that a written contract should, if ambiguous, be construed most strongly against the party preparing it.

. . . the small type

A great deal of discussion has risen in the past over "What legal effect has a printed notification in the contract, receipt, bill-head, bill of lading, order form, letterhead, or the like?"

Modern higher courts consistently hold that a statement of notification or notice printed in small or inconspicuous type is not valid and binding unless it is referred to in the body of the contract, or verbally called to the attention of the other contracting party. This same law applies alike to contracts by correspondence and various other kinds of written agreements.

An illustration of the law, with respect to the validity of printed notifications on letterheads, is supplied by the leading case of Lyons v. Cusimano, 108 So. 414. Here it was disclosed that a manufacturer sent his salesman to interview a gas company's purchasing agent, and arrange the details of an important contract. The salesman and the purchasing agent entered into a written agreement that embraced all important points. Later the manufacturer wrote a letter to the corporation acknowledging the contract, and printed in small type on the letterhead at the bottom of the letter was the following notification:

"It is understood that there are no conditions, representations, or warranties, verbal or otherwise, and that . . . no agent or representative has authority to modify the terms of this contract."

Legal controversy developed when the manufacturer failed to ship merchandise of the quality verbally promised by the salesman. In the ensuing litigation the manufacturer contended that the printed notification protected him against unauthorized verbal promises made by his representative. However the court held the notification *not* effective, saying:

"The statement in the letter declaring that there were no conditions, representations, or warranties, verbal or otherwise, was printed in very small type, and was not likely to be read. . . ."

For comparison, see the leading higher court case of August v. Minte Company, 50 N.E. (2d) 121. The testimony showed facts, as follows: A manufacturer's typewritten letterhead contained a printed statement that the manufacturer would not be responsible for delays in delivering merchandise sold to the purchaser, because of strikes, accidents and other uncontrollable delays. In the main body of the typewritten letter the seller promised delivery on February 1st.

In subsequent litigation the higher court held the manufacturer liable in heavy damages for failing to make delivery before February 1st, although due to labor trouble, the manufacturer was delayed in delivering the equipment until after February 1st. This court said, "If printed matter forms a part of the contract then it must yield to written terms inconsistent with the printed words."

Also, in Summers, Hibbard, 38 N.E. 899, it was shown that at the top of a letterhead was a printed line, "All sales subject to strikes and accidents."

This court held that this *printed* line did not relieve the seller from damages for failure to deliver merchandise on the date agreed in the body of the typewritten letter. This court said:

"The printed words were not in the body of the letter or referred thereto."

According to this higher court decision, if a printed clause is referred to in the pen-written or typewritten letter, such printed clause is equal in priority and importance to the pen-written or typewritten part of the contract.

Pen-written interlineations

Pen- or hand-written stipulations or clauses have priority and importance over typewritten or printed clauses in a contract, letterhead or other instrument.

For example, in Baum, 114 Pac. (2d) 560, it was shown that a contract was partly printed and partly typewritten. Also, pen-written stipulations were inserted between the printed lines.

"Where the correct interpretation of such a contract is in doubt," this court held, "the interlineations in pen *control* as against the printed and typewritten portions of the agreement."

Inconspicuous clause is valid

Notwithstanding the above explanation, an inconspicuous clause *is* valid if it is referred to in the body of the contract or otherwise directed to the attention of the buyer of merchandise, gas equipment and supplies. This law is based on the fact that if a purchaser knows that an inconspicuous clause exists, the court will assume that he *intended* to be obligated by it. This same law is effective as to all other clauses of which the purchaser had knowledge, or should have had knowledge had he used ordinary care to read the contract and realize his obligations.

For example, in Mortin v. Southern Engine Company, 130 S.W. (2d) 1065, it was shown that a manufacturer of an engine inserted in the printed contract a pen-written clause, "The company shall not be responsible for damages in use of this machine. . . ."

A printed clause in the contract stated that the engine was guaranteed to pull a specified load. The purchaser sued the manufacturer and *proved* that the engine would not pull that specified load and had breached the guarantee.

The purchaser asked the court to allow him damages which he suffered because he lost time and money while endeavoring to use the machine. The higher court refused to award any damages, and said, "It is well settled that parties to such a contract of sale may provide for a limitation of damages in case the seller breaches his warranty."

Hence, the seller's pen-written guarantee limitation clause had priority over his printed guarantee clause.

Therefore, the law is well-established that if an official of a gas company intentionally assumes unusual obligations, or fails to use ordinary care to read a contract and knows his assumed obligations, he is fully liable.

Written vs. verbal contracts

A reader asked, Is a verbal sale contract as valid as a written contract? If so, why should contracting parties go to the trouble of making written contracts?

The higher courts hold that an oral or verbal contract may be, under certain circumstances, as effective and binding as a written one. Both kinds of contracts are governed by similar rules of the law. In fact, it is generally conceded by all higher courts that the legal difference between a written and verbal contract is that convincing evidence and testimony must be given to prove obligations of a verbal contract, but the words of a written contract conclusively interpret the obligations of the contracting parties. Moreover, verbal promises or agreements have absolutely *no* effect to vary or change the meaning of a written contract, unless (1) it is shown that such verbal promises were made by the seller to fraudulently induce the purchaser to enter into the agreement; or (2) that the buyer and seller verbally agreed to cancel the complete written agreement and substitute therefor the new verbal agreement.

American Gas Fundamentals OUTLINE

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- *Geology
- *Drilling and completion
- Methods of estimating reserves
- Chemicals from gas

MANUFACTURED GASES
- *Coke oven gas; producer gas, blue gas; carbureted water gas
- *Reformed gas
- *Hi-Btu oil gas
- Interchangeability

LIQUEFIED PETROLEUM GASES
- *Sources, properties and uses

BASIC GAS LAWS
- *Perfect gases
- Supercompressibility

TRANSMISSION
- *Pipe lines
- *Corrosion and pipe protection
- Compressor stations
- Hydrates and dehydration
- *Gas conditioning
- Flow formulae
- Principles of orifice measurement
- Pipe coatings and protection methods

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- Rights-of-way

*** Indicates chapters published since January 1, 1951; available without charge to new subscribers to American Gas Journal.**

How to Use the Material

American Gas Fundamentals *is a comprehensive compilation of basic gas facts to guide any gas utility employee toward a broader understanding of the industry as a whole.*

The series is designed to be removed from each current issue of American Gas Journal *and filed in a ring binder where it may be accumulated into a text book of permanent usefulness. Material should be filed under the major subject head appearing in the upper right hand box at the head of each chapter.*

Principles of Orifice Measurement

THE use of the orifice in the measurement of fluids, particularly water, has long been employed by mankind. This use in measurement in open systems dates back many hundreds of years. We find mention made in both Egyptian and Greek historical records of the orifice and its use on water measurement.

In 1797, an Italian physicist, Giovanni B. Venturi, at the University of Modena, demonstrated through many experiments, the important principle that fluids under pressure in passing through converging pipes gain speed and lose head, and vice versa in diverging pipes.

Even so, it was not until 1886 that Clemens Herschel, a hydraulic engineer, with the Holyoke Water Power Company (Massachusetts) developed the venturi tube (named after the Italian physicist) and applied this basic principle to closed systems.

Shortly after that, in 1904, orifice measurement received further emphasis with the investigation of flange tap orifice coefficients by Thomas R. Weymouth.

The basis of our present day differential measurement is the relation between the rate of flow of a fluid and its loss in pressure in flowing through a restriction in the line of flow. In more precise terms, we know that the pressure loss caused by a restriction is proportional to the square of the velocity of the fluid.

Fig. 1-A shows a conventional venturi tube or throat, as used by industry today. The venturi tube has lost out in popularity in the gas industry but is still employed by refinery, chemical and other industrial users, where a minimum permanent pressure loss is desirable. Venturi tubes are likewise employed where the flowing fluid contains considerable solids and other material which might conceivably be abrasive in nature. Viscous fluids are sometimes measured by means of the venturi tube.

The flow nozzle, Fig. 1-B, is a venturi throat without the tail section. It is similar in performance to the venturi throat, but shorter in its length.

The sharp edged orifice plate, shown in Fig. 1-C, has become the most widely accepted of all the primary differential measurement devices, because it is most practical, easiest to duplicate and most economical to produce. It came into prominence in the early 1920's and received greatest support from the petroleum industry. Today, in the production, transportation and distribution of natural gas, the use of the flat, sharp edged orifice plate is almost universal, particularly where flow rates are larger than could be measured by a diaphragm or positive type meter.

American Gas Association, in Report No. 2, specifies that the upstream face of the orifice plate shall be as flat as is commercially obtainable and that the upstream edge of the orifice should be sharp and square and not reflect a beam of light when viewed without magnification.

It is general practice to employ an ⅛" thick orifice plate although ¼" thick plates are used in large-sized lines and in some of the very large-diameter lines, such as 30", plates as thick as ½" have been employed. Important points to remember with reference to the orifice plate, are that it should be bored accurately with a sharp upstream orifice, that it should be flat and polished to eliminate blemishes and scratches.

In Fig. 1-C, it will be noted that as the stream approaches the orifice it tends to converge in order to pass through the orifice. The approach velocity, and the velocity component which is set up due to the change in direction at the plate, produce a section just beyond the plate called the *vena contracta*. This is the smallest diameter of the flow stream. As may be seen in the illustration, beyond this point the stream gradually expands until it again fills the entire pipe section. In Fig. 2 the maxi-

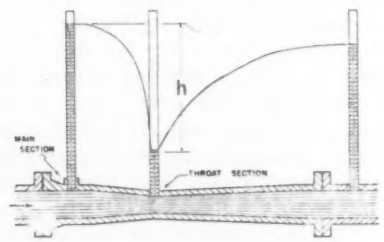


Figure 1-A.
VENTURI TUBE

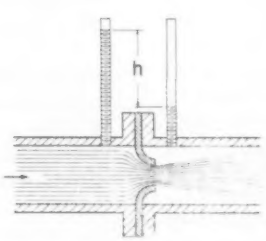


Figure 1-B.
FLOW NOZZLE

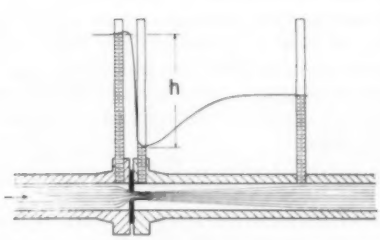


Figure 1-C.
FLAT ORIFICE PLATE

mum differential set up by the orifice plate occurs with flange taps or throat taps, whereas the pipe taps are functions of the permanent pressure loss in the system.

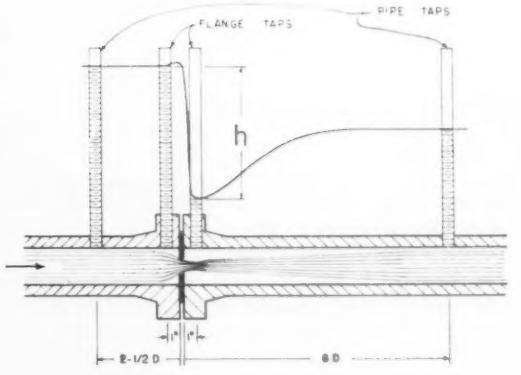


Figure 2.
FLAT ORIFICE PLATE FLANGE AND PIPE TAPS

The restoration of pressure with the sharp edged orifice in Fig. 2 is considerably lower than the pressure recovery obtained by the venturi in Fig. 1-A. This is due primarily to the energy which is lost in turbulence forming the *vena contracta* section. That energy loss is permanent. The explanation of this primary disadvantage of the flat orifice plate is that it does not have the smooth approach and exit contours of the venturi tube and the pressure recovery is rarely more than 60 per cent of the total pressure drop at the plate. Under most measurement conditions, however, this pressure loss is usually a very small part of the total pressure involved and is generally inconsequential.

The Flow Formula

The theory of the basic flow formula that accounts for the basic pressure difference or differential is derived from the law of the conservation of energy and from a simple extension of the reasoning of the physical law of free fall.

The basic premise of this law is that velocity of a body falling freely *in vacuo* equals the square root of the sum of twice the gravity times the vertical height.

This law may be expressed $V = \sqrt{2gh}$.

Carrying this basic formula through a series of extensions and mathematical substitutions, we arrive at our fundamental flow formula, which states that the quantity or rate of flow in cubic feet per hour, equals an experimentally-derived flow constant which has been corrected for various factors, times the square root of the height of the water column or differential, multiplied by the absolute pressure.

We express this formula: $Q_h = C' \sqrt{hw\ Pab.}$

The C′ factor or corrected coefficient is developed from the multiplication of all the various factors listed in this formula: $C' = F_b \times F_r \times Y \times F_{pb} \times F_{tb} \times F_g \times F_{pv}$.

The first factor F_b is the basic orifice flow factor and is by far the most important. This factor takes into consideration the orifice diameter and includes experimentally-derived corrections for the effect of the pipe size on the flow coefficients and for the location of the pressure taps. It brings into the formula the thickness of the orifice plate, its sharpness, the length of the meter run and other basic factors of the primary element.

The next factor F_r, termed the Reynolds number correction, recognizes that in flow, the center of the stream has an appreciably higher velocity than the side elements of the stream which are held back somewhat due to friction contact with the walls of the pipe. This is complicated in the *vena contracta* where this velocity or flow factor is compressed and distorted. This factor is not related alone to velocity or density or viscosity, but it governs the overall type of flow of the gas or fluid as to whether it is viscous or non-viscous or where it may fall between these two extremes. Since the Reynolds number factor theoretically would change with each differential change or each change in absolute pressure, theoretically it should be computed for each value. In actual measurement practice, however, it would be impossible to make this flow-to-flow calculation and generally the Reynolds number correction is made on a 24-hour or weekly basis, with sufficiently accurate results for present commercial measurement.

The application of the expansion factor Y, applies only when gases are being measured. It is assumed, in the case of fluids, that fluid density does not change as it passes through the orifice. In the case of gases, however, the density changes as the gases flow through the orifice and into the *vena contracta* region. Applying the law of gases, we find that the change in density is proportional to the absolute pressure. This means that in cases of low differentials or low water column pressures the density changes are relatively small. It may be said then that the expansion factor, Y, is always a very small correction when the differential is low and the absolute pressure in the flowing system is high. On the other hand, the expansion factor should always be considered when low pressures are involved and high differentials are obtained.

The expansion factor is related to the type of pressure taps used. Special charts are available listing this factor for flange taps, pipe taps, or averages of both up- and downstream tap readings. As in the Reynolds number correction factor, the expansion factor correction is known as an accumulative error. This error is in a constant direction, and unlike any plus- or minus-error, it will not cancel out. It is recommended that the magnitude of the error be determined and a correction factor be applied, if necessary.

Inasmuch as the expansion factor is a function of the immediate flowing conditions and while theoretically a correction shou'd be made for each differential and pressure condition, it is not wise to do so from a practical standpoint. Generally, making a 24-hour correction for the average expansion factor is quite satisfactory.

In applying the pressure base factor F_{pb} and the temperature base factor F_{tb}, we are defining the unit of gas being measured, namely the cubic foot. Since gas is so directly affected by temperature and pressure it must be defined in terms of a given absolute pressure at a given standard temperature. AGA Report No. 2 includes a basic factors table, based on an absolute pressure of 14.4 lbs. per square inch and uses a temperature base of 60° F. This is an attempt to set up a basic or standard cubic foot.

The flowing temperature factor, F_{tf}, is utilized when the gas which is being measured has a temperature which deviates from the 60° F base. If the flowing temperature

departs from this 60° F base, a temperature correction should be applied to bring it back to the 60° F base.

The specific gravity factor F_g, considers that all basic coefficient factors are based on a fixed specific gravity. The basic factors published by AGA give the specific gravity of air as 1.0. For any given gas the specific gravity must be known and the correction factor applied for the extent of deviation from specific gravity of air. The correction factor for the specific gravity of the gas is then multiplied into the coefficient.

In discussing the supercompressibility factor F_{pv}, we have assumed the reliability of Boyle's Law which was explained in the chapter on "Basic Gas Laws for Perfect Gases." In actual practice, the volume of the gas does not always vary inversely as to its absolute pressure at a given temperature. As the gas is compressed, its volume contracts and its density tends to increase by an amount greater than that which would be indicated by Boyle's Law. This has been termed the supercompressibility of gas. Much data has been developed on this and it has been determined that supercompressibility is of relatively little importance in low pressure measurement but it becomes a significant factor in medium pressures, from 200 to 500 pounds, and is extremely important in pressures that are greater than 500 pounds.

Following these considerations of the basic flow formula and its various corrective factors, there are the factors involved in designing the gas meter run and the various accessory elements to flat orifice plate measurement.

Physical Conditions Affecting the Orifice Plate

It has been shown that the basic orifice flow factor, F_b, was based upon certain definite physical flow conditions, such as pipe size, *beta* ratio, sharp upstream orifice edge and pressure tap location. It can be seen that should any of these critical physical dimensions vary in the orifice area, the basic flow factor becomes invalid. An example of this would be the upstream sharp edge of the orifice plate, which if rounded would make a larger discharge coefficient necessary for the same flow of gas. The flat orifice with a rounded upstream orifice edge would read low. Very quickly, the error can be from two to five per cent.

AGA Report No. 2 emphasizes that the internal roundness of the meter tube is extremely important. The report states that the permissible out-of-roundness is in direct relation to the *beta* ratio. For example, with a *beta* ratio of from .65 to .75, for flange taps the permissible out-of-roundness cannot be more than 0.5 per cent. For pipe taps the out-of-roundness cannot be more than 0.2 per cent. With flange taps using 6″ pipe for the meter tube, the permissible out-of-roundness should not be more than 30 thousandths of an inch (0.030″).

The tolerance shown in Fig. 3 applies solely to the upstream meter tube and it is recommended that in the downstream meter tube out-of-roundness should not exceed twice the upstream tolerance.

The AGA report further recommended that when an orifice fitting is used, the out-of-roundness should not exceed one-half of that permitted for flange taps. Therefore, in fabricating a six-inch meter tube to go with a six-inch orifice fitting and to use *beta* ratios as high as .65 to .75, the upstream orifice tube cannot be out-of-round by more than fifteen thousandths of an inch (0.015″). The downstream meter tube should not deviate by more than thirty thousandths of an inch (0.030″).

The reason for this close tolerance is that an orifice fitting has a machined bore and will not be out-of-round by more than two thousandths of an inch (0.002″). It is very important to hold the meter run as closely as possible to the bore and the roundness of the orifice fitting. Otherwise, a shoulder or mis-alignment will result and set up turbulence in the flow at a most critical position.

In the fabrication of meter tubes, there are essentially three phases: (1) selection of pipe, (2) machining and welding operations and (3) calibration and inspection.

1. In selecting the pipe it is well to pick pipe that is as smooth and free from blisters and scale as possible. The actual internal diameter of the pipe should be determined with a set of internal micrometers on the vertical, horizontal and both diagonal planes; a minimum of four readings in one position. The pipe should be "miked" approximately an inch inside the outer edge and then perhaps a full diameter inside; also, both ends of the pipe.

2. The welding and machine work on the meter run is contingent upon the design of the meter tube and the type of flanges employed. The trend is toward the use of welding neck type flanges or welding neck orifice fittings. A special internal expanding jig has been developed which is installed partly in the welding neck flange and partly in

Orifice-to-Pipe Diameter	Recommended Maximum Allowable Tolerance between measured inside diameter of the upstream section of the meter run, and the published "Approximate Internal Diameter", which was used in computing basic orifice constants.	
RATIO "B"	FLANGE TAPS *(Per cent)*	PIPE TAPS *(Per cent)*
.10 to .25	5.0	3.5
.25 to .35	3.0	2.0
.35 to .45	2.0	1.0
.45 to .55	1.5	0.6
.55 to .65	1.0	0.3
.65 to .75	0.5	0.2

Figure 3. BETA RATIO AND TOLERANCE

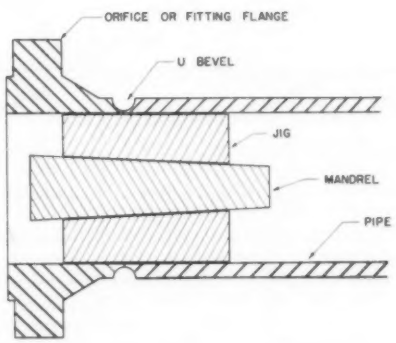


Figure 4. INTERNAL ALIGNMENT JIG

the pipe. This jig lines up the flange and pipe; it prevents welding "icicles" forming inside. (See Fig. 4)

After the welding is finished, the jig is driven out; it is not necessary to re-face the flange or otherwise machine the meter tube.

3. Inspection of the meter tube should include close examination of all welded spuds, thermometer wells, test wells, etc. The edges of these holes on the inner surface of the pipe should be free from burrs; all connections should be located in conformance to AGA recommendations.

The meter tube length is directly related to the general piping design and whether control equipment and valves have been installed either up- or downstream to the meter tube. It is always a safe rule to eliminate bends and piping designs which will cause turbulence upstream from the meter tube. A smooth streamlined flow approaching the orifice is of considerable value in securing accurate measurement.

Straightening vanes are utilized to eliminate low readings and correct turbulent conditions. A straightening vane used for gas measurement is a bundle of small tubing welded together at tangent points. Generally, this bundle of tubing is inserted upstream in the orifice meter run, six to eight pipe diameters from the face of the orifice plate. This straightening vane, eliminating swirls and turbulent flow, also gives a more lamellar stream of gas.

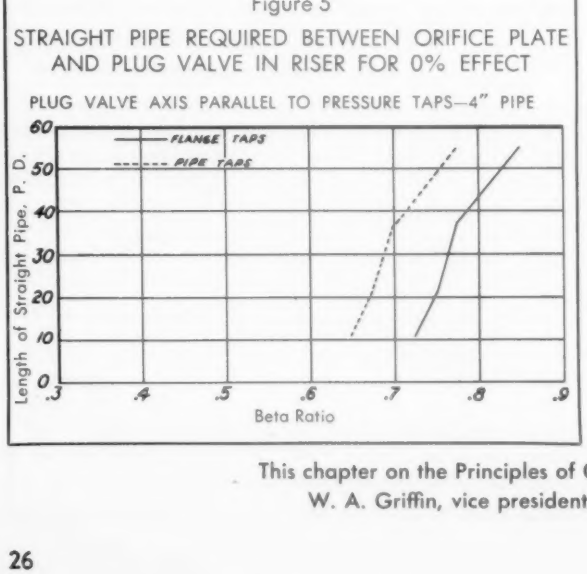
Figure 5 shows straight pipe required between the orifice plate and the plug valves for both flange and pipe taps, when the plug valve is in the riser. In this case the plug valve axis is parallel to the pressure taps. This chart indicates that, with flange taps and the plug valve in the riser, it is possible to shorten the upstream meter run length to approximately eleven diameters and still not have any effect on the measurement with .725 *beta* ratio. With pipe taps and the same conditions the *beta* ratio drops to .65.

With flange taps, when plug valves are in the meter tube, rather than in the risers, and the upstream run is eleven pipe diameters, the *beta* ratio drops from .725 to .65. With pipe taps and the same conditions, the *beta* ratio drops from .65 to .55. This indicates that when short tubes are contemplated, it is desirable to install the plug valve in the riser. The above data does not imply that longer meter tubes are inadvisable. Quite the contrary; where space is not a limiting factor, particularly in public utilities and large transmission companies, present practice would indicate that 25 pipe diameters upstream with removable straightening vane, and 15 diameters downstream, are excellent lengths for accurate measurement.

Figure 5

STRAIGHT PIPE REQUIRED BETWEEN ORIFICE PLATE AND PLUG VALVE IN RISER FOR 0% EFFECT

PLUG VALVE AXIS PARALLEL TO PRESSURE TAPS—4" PIPE



No discussion of present day meter tube practices would be complete without discussing honed meter tubes.

Honed meter tubes are more expensive, since their manufacture is a slow process; pipe having such a relatively thin wall expands and contracts during the honing process. Another factor is that these honed meter tubes are more or less true cylinders and usually have a tolerance of plus or minus .004" at any point in the entire meter tube length. The inside finish of a honed meter tube is entirely dependent on the grid of the stone used and any desired degree of roughness can be obtained. For example, very smooth meter run tubing, when it comes from the tube mill, generally has a No. 50 finish in the microinch roughness scale. Medium-to-rough pipe will run from 200 to 450 in the microinch roughness scale. These same finishes can be duplicated in the honed meter tube; a microinch roughness of approximately 125 is recommended.

Information is rather limited as to comparative measurement through honed meter tubes and conventional pipe. Most data indicate that honed meter tube or meter tube fabricated from special meter run tubing provide higher measurement than a meter run fabricated from conventional pipe. This may indicate that the honed meter tube, being a more perfect cylinder throughout its entire length, provides more accurate measurement than standard pipe in which out-of-roundness can be ascertained only at the ends.

In the design of differential static pressure recorders, the mercury float type is the most widely used differential recorder measuring gas. This type of instrument is a mercury U-tube manometer with the float riding on the surface of the mercury on one side; the other side of the manometer leg is a calibrated range tube. These secondary recording meters have the differential pressure and the static pressure piped to them from the primary element by means of orifice meter pipes. The orifice meter piping is generally designed, by means of a valve by-pass arrangement, so that the meter may be taken out of service for periodic checking and calibration with a water column.

Conclusion

Differential measurement has become more and more refined. Measurement engineers are no longer interested in measurement that is only an approximation. They know that it costs almost as much to measure incorrectly as it does to install adequate and correctly designed facilities.

One transmission company, transporting gas from Texas to the Eastern Seaboard, handles in excess of fifteen billion cubic feet of gas per month. Over the last ten-month period, their measurement balance checked out to within four hundredths of one per cent. (0.04%).

Gas, as a product or an economic commodity, has more value today than at any other time in the history of the gas industry. More people are concerned with its production, its transmission and its consumption. As a result, therefore, more people are interested in accurately measuring and controlling gas.

This chapter on the Principles of Orifice Measurement was prepared by W. A. Griffin, vice president, Daniel Orifice Fitting Company.

Corrosion Control Economics

by A. W. Peabody

Electrical Engineer
Ebasco Services Inc.

ALTHOUGH the gas industry as a whole is now much more corrosion-conscious than it was relatively few years ago, there still remain many gas systems which could be improved, from an economical operating standpoint, by a more thorough application of known means of corrosion mitigation.

One of the major obstacles that must be overcome is the often-encountered tendency to design systems or particular installations within a system with little thought concerning the possibility of gas loss or system outages which can result from corrosion damage. After such damage has occurred, adequate corrosion preventative measures are usually wanted but are then found to be relatively expensive to apply.

Another obstacle is a tendency to continue to utilize materials or equipment that, although the best available for corrosion resistance when adopted, may have become outmoded through modern research and development.

It becomes apparent that a particular objective is to encourage all gas system operators to review their construction and operation practices and, where not already the case, to consider the advantages of treating corrosion mitigation as one of the more important factors to be incorporated in the original design of all contemplated construction, to study the savings possible through emphasis on corrosion control in operating practices, and to investigate corrosion control practices and operating experiences of other gas companies.

The particular advantage of designing against corrosion *at the proper time* is gain in operating economy through longer system life, reduction in gas losses, and reduction in hazard from leaking gas.

There is no question that leakage-free systems resulting from adequate corrosion control incorporated in original designs will be an important factor in maintaining satisfactory public relations.

Distribution Systems

New distribution systems can now be designed for nearly one hundred per cent corrosion-free operation. Operators of older systems suffering from corrosion must often contend with complex main networks, usually under pavement, which may contain intermixed steel and cast iron pipe, bare and coated sections, services of different materials from mains, and contacts with underground plant of other utilities.

All these conditions can contribute to aggravated corrosion. Programs can be initiated which will reduce existing corrosion problems on such a system but there is no reason why all extensions to such a system cannot be designed to be corrosion-free. From the standpoint of dollars and cents, such a program will assist in stabilizing maintenance costs, even though the system as a whole may be expanding rapidly.

Mains

Proper use of materials is particularly important when laying mains in corrosive areas. The danger lies in galvanic corrosion which will result from dissimilar materials in electrical contact. Undesirable combinations of this type include steel and cast iron, old steel and new steel, copper and steel or cast iron, and galvanized pipe in contact with steel, cast iron, or copper. This does not mean that dissimilar materials should not be intermixed but it does mean that they should be so installed that galvanic corrosion between dissimilar materials cannot occur. Insulated coupling devices are commercially available for joining cast iron mains to steel mains, for joining steel mains to each other, and for joining other materials to steel and cast iron.

When making replacements in an old main system, care must be exercised in the use of materials.

Coatings for mains are many and varied. There are some general points which are helpful when using coatings.

Where cathodic protection is to be used on distribution mains, coated pipe is much easier and cheaper to protect than bare pipe and will require fewer and much less expensive protection installations. The amount of electric current required to protect coated main will depend on the electrical strength of the coating which in turn depends on the type of coating used and care in application. The higher the electrical resistance of a completed coating job, the lower the amount of protective current required. In general, coal tar enamels, some asphalts and other hot-applied coatings have a high electrical strength while most cold-applied coating materials have appreciably lower resistance. Experience has shown that a reinforcing wrapper of the proper type will greatly increase the average electrical strength of the completed coating job.

When used without cathodic protection, quality of coating application work is particularly important since corrosion damage is possible at any defect in the coating film.

Under certain conditions, a coating can result in earlier failure than would have been the case if pipe had been installed bare.

In addition to providing insulation between dissimilar metals within the main system, good corrosion control practice includes keeping steel systems free of contacts with other structures. This includes direct contacts with cast iron gas or water mains as well as contacts with the water system through uninsulated service lines. Direct contacts can be prevented by suitable supervision during construction while contacts through services can be prevented by installing suitable insulating devices at the meter loops.

These isolating measures involve minor expense if taken during construction but can be relatively very expensive on an old system.

On distribution mains, cathodic protection is best employed on new construction as an accessory to pipe coating and proper insulation. Cathodic protection, properly applied and maintained, will eliminate corrosion which could otherwise occur at defects in the pipe coating.

Even though the cost of coated and cathodically protected mains is greater, initially, than that of bare pipe, long term operation will show savings through reduced maintenance costs and longer system life. Another point concerns pipe weight; by eliminating external corrosion, it is possible to realize savings in initial cost by using lighter weight pipe than would be required if extra wall thickness had to be provided as a corrosion allowance.

The source of direct current for cathodic protection will normally be either rectifiers or galvanic anodes of zinc or magnesium. Galvanic anodes are particularly convenient for use in congested areas if current requirements are within economical limits for their use. Rectifiers will furnish ample current for cathodic protection but caution must be observed to avoid high current concentrations in the vicinity of unprotected underground structures which might be damaged by uncontrolled pick-up of the rectifier current.

The amount of cathodic protection current required will depend on the amount of coated pipe surface to be protected and the type of coating used. Experience with coatings used on a particular system will normally permit electric current requirements to be estimated with sufficient accuracy to permit designing cathodic protection systems which can be installed along with new main construction projects.

Cathodic protection with galvanic anodes is particularly useful for short coated main extensions. Distribution companies with full corrosion control programs usually protect all such main extensions in this manner by insulating them from the remainder of the system and installing anodes at the same time that the main extension is laid.

The preceding paragraphs might be interpreted to imply that cathodic protection is not effective on bare mains. Application of this type of protection on bare distribu-

(Continued on page 36)

Effects of Gas Conditioning on the Distribution System

by C. A. Kooke

Assistant Superintendent Gas and Steam Distribution

Consolidated Gas Electric Light and Power Company, Baltimore

IT was decided that initially we would take natural gas at three points. A 26" main from the manufacturing plant is an integral part of our distribution system and passes through our low-pressure and high-pressure system service area. The pressure is reduced from the supplying company's transmission line pressure to approximately 150 pounds pressure at the delivery point and there are several connections in the low-pressure service area where the gas is introduced through pressure-reducing stations ahead of the terminus of the main at our manufacturing plant. All gas is odorized at the receiving points with a mercaptan type odorant.

We have had a little over two years experience with natural gas distribution and utilization.

Each distribution system has its individual characteristics. The question of whether or not to condition natural gas is admittedly still controversial. I believe that the industry is reaching the conclusion that gas conditioning is necessary to good distribution operations.

Literature on the subject revealed that a great deal of trouble had developed in some areas where dry, unconditioned natural gas had been introduced into a system that had previously carried wet manufactured gas. It seemed clear that distribution systems that were not properly treated became dried out and leaks developed, and also that materials that had deposited and accumulated on the interior surfaces of the mains and services during the years when manufactured gas was distributed, later dried out and formed dust, carried along by the velocity of the gas. Jute packing in cast iron bell and spigot joints became dehydrated and no longer sealed the joint effectively.

After a thorough study, we concluded that our conditioning program should be set up early and should include both humidification and oil fogging.

In our case, conditioning of the natural gas is the responsibility of our gas manufacturing department. All gas entering our low and medium pressure distribution systems from the natural gas "tie-in" lines is humidified prior to oil fogging.

Steam or water spray is introduced into the gas stream approximately six feet ahead of the point where the oil fog is introduced. It is desirable to have a 90° change in the direction of gas flow between these two points of introduction to facilitate the removal of the heavier and useless water droplets. The moisture in the gas is controlled so that the amount of condensate removed from the drip pots in the distribution system is held to approximately the same amount as that removed from these pots before conversion to natural gas. Humidity tests are made throughout the system as a further indication of conditions in the mains.

The natural gas supplied directly to our high pressure distribution systems is not humidified because only relatively small quantities of moisture would be absorbed by the gas at such pressure. Where humidified gas is pumped from the low pressure or intermediate pressure systems and compressed to 100 lbs. per sq. in. for high pressure distribution, the gas is cooled by a refrigeration unit at the compressor station to remove excess moisture before it enters the distribution system. Alcohol is added to the gas at these locations during cold weather to prevent hydrate formation.

At the time we were preparing for conversion we could not find a hot oil fogger which incorporated the features which we felt were necessary to obtain continuous trouble-free operation, adequate control of fogging rates and maximum fog stability. Consequently it was necessary for us to design one.

This oil fogger "embodies the principles of heating the sweep gas rather than supplying direct heat to the oil; continuously contacting the hot gas with fresh oil, and continuously removing the residue of unvaporized oil from contact with the gas stream. The fogging rate is positively controlled through the rate at which oil is added to the gas by a controlled volume pump." The oil we use for fogging operations is Atlantic "K" oil, a paraffin base oil having a boiling range of approximately 570 to 670° Fahrenheit.

We started oil fogging operations about six weeks prior to the beginning of our conversion to natural gas.

Fogging was carried on during conversion by introducing oil at a rate of approximately 1½ gallons per million cubic feet and at approximately 1 gallon per million cubic feet thereafter. Our experience indicates that a rate of 1 gallon of oil per million is sufficient once the system becomes oil-wet.

Our endeavor has been to maintain oil and moisture conditions in the distribution system when distributing natural gas similar to those which existed when manufactured gas was distributed.

There have been a few instances where the odorant level in small areas was lower than the level we consider normal. This indicated to us that probably the oil fog had not reached these areas of the system in sufficient quantity. These conditions are remedied by cold spraying or atomizing the same type of oil into the main at high pressure through special connections in the top of the main.

High pressure gas from a compressor mounted on a truck and operated by a power "take-off" from the truck engine is used to atomize the oil through a special spray head inserted in the main. The spray produced by this method does not travel long distances, but is effective in correcting and raising the odor level in these areas. Wherever possible the spray is introduced into the mains at the crest of a hill and in the direction of the gas flow.

It has been a little difficult for us to understand, but we have experienced trouble in promptly establishing proper odor concentrations in *new* steel main extensions. Apparently the slight film of corrosion on the interior surface of the steel pipe absorbs the odorant in the same manner that the iron oxide dust or rust does in the older mains on the system. It is now standard practice with us to "cold fog" all new, large size, steel main extensions so that the proper odor level may be established concurrent with use.

We are confident that our gas conditioning program has been effective in maintaining pre-conversion conditions in our distribution system. Immediately after conversion we instituted an extensive program of leak detection. Since we found relatively few leaks other than those very small ones normally experienced with lead joints, the program has been modified.

"Unaccounted-for" gas on our system has remained low. For a period of three years prior to conversion our "unaccounted-for" averaged about 2%. Since conversion it has been about 4%, which is to be expected since in converting from 500 Btu manufactured gas to 1050 Btu natural gas the volumetric send-out of the system is initially cut about in half.

We have not introduced any joint sealing compound into our low pressure cast iron distribution system, and do not consider it necessary to do so. We have had no evidence of either a dust storm or isolated dust troubles in any part of our system.

Requests for service from our customers are now much lower than we had anticipated. Pilot troubles in particular have markedly decreased. During the summer after conversion, our calls for pilot service were of the order of 4000 per month; this past summer they were about 2900 per month. While we advocate the use of gum filters and other gum protective devices on appliance pilots, there are hundreds of appliance pilots on our lines that are not so protected. These unprotected pilots are still vulnerable to stoppage by the minute rust and dust particles which could be carried along by the gas flow. We believe that a gas conditioning program such as the one we followed will pin down most of these small particles but there is still the chance that

(Continued on page 35)

Selah S. Tomkins

Selah S. Tomkins, 57, chief chemical engineer of Consolidated Edison Company of New York, Inc., died October 29. He had been associated with the New York utility since 1917 and had long been prominent in gas utility association work.

Born in New York City September 13, 1895, Mr. Tomkins was graduated from New York University in 1917 and that year became a chemist in the laboratories of Consolidated Gas Company of New York, now known as Consolidated Edison. Mr. Tomkins received a post-graduate degree in chemical engineering from N.Y.U. in 1919.

In 1926, Consolidated Gas promoted Mr. Tomkins to the post of assistant to the chief chemist and three years later he was named assistant chief chemist. In 1937 he was made laboratory engineer and his title was later changed to chief chemical engineer.

He was, at the time of his death, a member of the research committee of American Gas Association. He was a president of Gas Engineering Society of New York and former director of the fuel section of American Chemical Society.

G. Max Thomas

G. Max Thomas, 65, senior valuation engineer of Pacific Gas and Electric Company, San Francisco, died on October 16.

Mr. Thomas was responsible for the valuation of PG&E properties in rate proceedings and for other purposes.

He was born in San Marcos, Texas, in 1887 and was graduated from the University of Texas as an electrical engineer in 1910. He received a Master of Science degree in the College of Mechanics at the University of California in 1911. His career with PG&E began the following year.

Mr. Thomas was made assistant valuation engineer in 1925, becoming head of the valuation department in 1941. He was made senior valuation engineer on January 1 of this year.

Northern Natural Plans for 825 MMcf

Northern Natural Gas Company plans to start construction of new facilities immediately with hopes of increasing the daily capacity of its pipeline system 20 million cubic feet a day by the first of the year. This will be in addition to the 40 million cubic feet of gas Northern made available on October 6th.

The company plans to continue construction of new facilities so that by next summer an additional 90 million cubic feet of natural gas will be made available. This would increase the company's daily capacity to 825 million cubic feet a day.

El Paso Using Gas Turbine

The gas turbine is now being used successfully to pump natural gas through pipelines by El Paso Natural Gas Company.

The first of twenty-eight 5,000 hp General Electric gas turbines for the El Paso system between West Texas and California has been placed in operation at Cornudas, Texas.

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News of the Gas Industry

AWARDING OF INDUSTRY OSCAR FOR BEST ANNUAL REPORT

Charles H. Gueffroy (left) president, Portland (Oregon) Gas & Coke Company, receives the bronze Oscar for his company's annual report, which was judged to be the best in the gas industry, last year. The presentation was made by Weston Smith, executive vice president, "Financial World," in New York late last month.

McCandless Now at AGA Headquarters

Bruce A. McCandless, formerly assistant to the director of the American Gas Association Laboratories, Cleveland, has been appointed assistant to the managing director of AGA. He joined the staff of the Laboratories in April, 1939. In 1949 he was appointed assistant to E. L. Hall, director of the Laboratories.

In his new capacity, Mr. McCandless will assist H. Carl Wolf, managing director, in the handling of executive details for the Association.

Transcontinental's 2d Line in NYC

A second natural gas line into the city of New York has been completed to serve the five gas distributors of Transcontinental Gas Pipe Line Corporation.

The 24-inch line enters Brooklyn after crossing Staten Island and The Narrows of New York Harbor. Transcontinental's other line serving New York crosses the Hudson River at 134th Street.

Delay in putting the second line into service resulted from a damage by a ship's anchor after the pipe had been pulled across but before the trench could be backfilled.

Divers cut the 6,600-foot line under water and then attached pontoons to lighten the load for the four derrick barges that hauled up the severed ends to a repair barge. A new section was welded into the line, X-rayed and coated. The rejoined line was lowered in the trench, tested, purged and filled with gas.

Lone Star Borrows $110-Million

Lone Star Gas Company, Dallas, completed a $110-million loan with The Prudential Insurance Company of America on October 15. Proceeds from the new loan will be used to retire outstanding loans, help finance a continuing expansion program, and augment working capital until additional revenue is realized under a current system-wide program seeking increased rates.

Eighty-five million dollars will go toward retirement of all presently outstanding funded debt and part of the remaining $25 million, combined with revenue derived from operations, will be used for reinforcements and additions to physical properties throughout Lone Star's operating territory in Texas and Oklahoma.

The financial transaction with Prudential was described as one of the largest ever closed in Texas.

UGI Merger Finally Approved

The United States District Court for the Eastern district of Pennsylvania, entered an order on November 12 enforcing Part 2 of the reorganization plan of The United Gas Improvement Company, including the merger into that company of its public utility subsidiaries. This constitutes the final approval of this merger. The stockholders of UGI approved the merger by an overwhelming majority. Previously the required approvals of the Securities and Exchange Commission, the Pennsylvania Public Utility Commission, the Federal Power Commission and the respective Boards of Directors and stockholders of each of the subsidiary companies had been obtained. It is contemplated that the merger will become effective at the close of business, December 31.

Ebasco Announces Executive Changes

F. C. Gardner was elected recently to the position of executive vice president, Ebasco Services, Inc.

He has been vice president in charge of engineering and construction since 1945.

At the same time, the consulting firm announced that K. W. Reece has been elected vice president in charge of engineering and construction. Mr. Reece joined Ebasco in 1925 and has been engineering manager since 1945.

Also, W. H. Colquhoun has been named engineering manager by Ebasco. He joined the company in 1941 and has been appraisal engineer, assistant to the engineering manager and was named assistant engineering manager in April, 1952.

Scanlon, Bieber Upped in Ohio Fuel

James A. Scanlon was elected a member of the board of directors of Ohio Fuel Gas Company and John A. Bieber was elected an assistant vice president at a recent meeting of the board.

Mr. Scanlon, vice president in charge of rates and regulations, started work with the Union Natural Gas Company, Pittsburgh, in 1922. He was transferred to Ohio Fuel Gas, Columbus in 1925 and elected treasurer in 1950; vice president last February.

Mr. Bieber has been Ohio Fuel Gas business promotion manager. In his new position he will represent the company in negotiations of contacts with wholesale and major industrial customers. He joined Ohio Fuel Gas in 1933 as a cadet engineer in the transmission department. Later he became district service manager in Findlay, local manager in Coshocton and Zanesville, and district sales manager in Cambridge and Elyria. He returned to Columbus in 1948 as general sales manager.

New Distribution Award to F. J. Hall

Frank J. Hall, superintendent of distribution plant, Michigan Consolidated Gas Company, won the Distribution Achievement Award, sponsored annually by American Meter Company. This first presentation of the award, made at the recent AGA convention, recognized Mr. Hall's contributions in the development of lightweight service trenchers. The citation by Mr. Charles E. Bennett, president of AGA, pointed out that Mr. Hall has many other distribution achievements and that, this year, he completed fifty years of service with Michigan Consolidated.

Bravery Award to E. L. McDougal

The Meritorious Service Medal of AGA, the highest honor the gas industry bestows for individual bravery, was awarded to Everett L. McDougal, construction foreman, Pacific Lighting Gas Supply Company, Los Angeles, at the recent AGA convention.

Mr. McDougal won the award for his conspicuous presence of mind in June, when he rescued a fellow worker from an excavation which was enveloped by a flash fire in a gas line. Mr. McDougal went into the fire and brought his fellow worker to safety.

J. W. Carroll Receives Beal Medal

The Beal Medal of American Gas Association for 1952 was presented at the recent convention to Jack W. Carroll, assistant superintendent of production, Philadelphia Electric Company, in recognition of his presentation on "Economics of Peak-Shaving," at the AGA Production and Chemical Conference, May 1952.

5 Home Service Awards at Convention

Outstanding accomplishments in home service work were recognized at the recent AGA convention by five awards, sponsored by *McCall's*. The five winners were considered to have made effective contributions to the advancement of home making by promoting the use of gas and modern gas equipment.

Home Service Achievement Awards were given to Miss Ruth Sheldon, home service director, Washington Gas Light Company; Miss Wanda M. Ewing, home service director, United Fuel Gas Company, Charleston, West Virginia; Miss Jean Hughes, home service advisor, United Gas Corporation, Houston; Mrs. Elyse Van Dyke, home service director, Alabama Gas Corporation, Birmingham; and Miss Ann Worden, Michigan Consolidated Gas Company, Grand Rapids.

Each winner received $200 and a bronze plaque.

MEN AT WORK

J. G. BERWANGER has been advanced to business promotion manager, *The Ohio Fuel Gas Co.*

ANDREW V. CHANDLER has been appointed mideastern regional manager, *Davey Compressor Co.*

WILLIAM M. CONNOR is now general manager, Macnick division, *Rockwell Manufacturing Co.*

HOWARD J. EVANS has been promoted to chief engineer, meter and valve division, *Rockwell Manufacturing Co.*

CHARLES F. HAUCK was promoted to assistant sales manager, chemical plants division, *Blaw-Knox Construction Co.*

WILLIAM H. HENSON has been appointed special sales representative, refractories division, *Norton Co.*

GEORGE H. JENKINS was named manager, Bartlesville, Oklahoma, division of *The Gas Service Co.*

CARL E. JOHNSON has been promoted to chief engineer, *Scaife Co.*

B. L. LERCH is now regional manager, *General Controls Co.*

ROBERT J. SARRAF has been promoted to chief chemical engineer, meter and valve division, *Rockwell Manufacturing Co.*

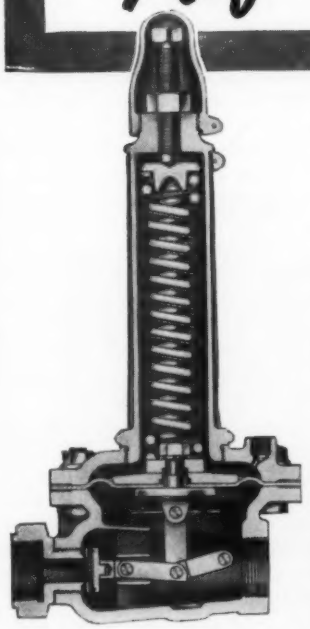
W. W. SELZER is the new dealer promotion manager, *The Ohio Fuel Gas Co.*

RUSSELL STRONGMAN is eastern seaboard regional manager, *General Controls Co.*

IN THE HIGH PRESSURE FIELD

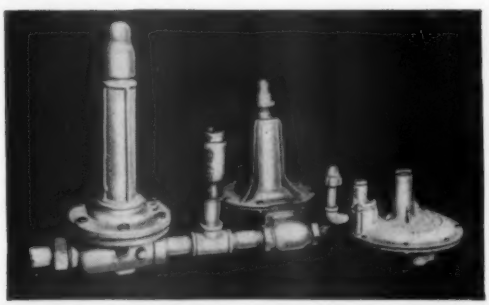
THERE IS SAFETY

IN *Reynolds...*



Accurate, Safe Control

of tremendous pressures is an ever present problem in the gas field. Reynolds field Regulator illustrated at left is one of the many high pressure regulators built by Reynolds. It is thoroughly tested and proved in service. It handles up to 1,000 pounds safely reducing same to pounds. For more than fifty-five years Reynolds has designed and built gas regulators. Safety, accurate performance, years of service—these are some of the built-in factors responsible for Reynolds enviable position in the Gas Control Field.



Reynolds Gas Regulator Co.

ANDERSON, INDIANA, U. S. A.

GAS CONTROL SINCE 1892

MORE GAS UTILITIES IN REFRIGERATOR COMPETITION

A total of 71 gas companies, seven more than in 1951, participated in the 1952 AGA-Servel "open-the-door" gas refrigerator sales competition, W. Paul Jones, president, Servel, Inc., announced at the AGA ceremony in Atlantic City where awards were granted winners.

Prizes totaling $40,000 were paid out by Servel to competing utilities and their sales managers, with 27 best-performance awards won by retail salesmen in the various classifications while sales managers of 14 utility companies also won awards. The winners in each classification were awarded self-winding clocks;—every retail winner, in addition, got an all-expenses-paid trip to Atlantic City for the AGA convention as the guests of Servel.

Peerless Adds Manufacturing Space

Peerless Manufacturing Corporation, Louisville, Ky., has just purchased a two-story building containing 75,000 square feet of floor space together with 30,000 square feet of yard area and 20,000 square feet of parking area. This building will be utilized for additional manufacturing and local storage.

NEW BULLETINS

PAC UNIT CENTRAL HEATER. An automatic gas heater with an input of 100,000 Btu and a nominal output of 80,000 Btu is described in this new bulletin. The equipment is for either suspension or base mounting.

Bulletin GNP-52-4. Pp. 4. Reznor Manufacturing Co., Mercer, Pa.

HAUCK HIGH PRESSURE GAS-AIR INSPIRATORS. The inspirator that is the subject of this bulletin is for use with any usual fuel gases at one to thirty pounds pressure. Capacity tables for these types of gases are given, with correction factors for differing specific gravities. Also, the bulletin includes descriptions of operations and suggestions for applications. Included in the same bulletin is a description of a high pressure air-gas booster for use as a high pressure inspirator in connection with low pressure gas. Similar data are given for this device.

Bulletin 806A. Pp. 6. Hauck Manufacturing Co., 124 Tenth St., Brooklyn 15, N. Y.

ELECTRONIK RECORDERS INDICATORS. The bulletin lists among the uses for these recorders and indicators temperature, humidity, chemical composition analysis, pressure, vacuum, and liquid flow level. The strip chart recorders are described and illustrated in full detail indicating clearly their flexibility for these types of industrial operations. Briefer, but entirely adequate, information is given for circular chart recorders. Also, there are detailed descriptions of the indicators, measuring elements and other related instruments.

Bulletin 1520. Pp. 48. Station 64, Minneapolis-Honeywell Regulator Co., Philadelphia 44.

Safety in Utility LP Gas Plants Depends on Basic Engineering and Sound Construction

(Continued from page 19)

installing LP gas pipelines must be decided upon after consideration of individual conditions and with continuing regard for sound engineering practices.

Cathodic protection may be necessary

Although it is the established practice to coat and wrap all underground LP gas lines, it has been found necessary to install cathodic protection for these lines against galvanic or electrolytic corrosion. The safety and economic factors involved in corrosion of gas pipelines are so great that the subject warrants full investigation to provide not-less-than adequate protection.

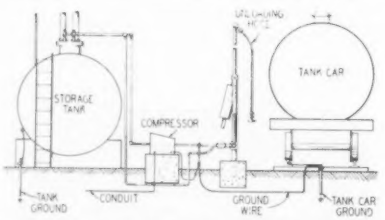
Electrical grounding as protection against lightning and static electricity must be provided for all parts of the system, including unloading equipment and the adjacent railroad trackage.

The use of buried pipes or other existing grounding systems are not recommended for LP gas plants.

The proper ground for a plant should be determined only after the resistance of the soil has been measured and, after installation, the grounding systems should be included on the program of periodic checking, to assure continued maintenance of a minimum indicated degree of effectiveness. A ground resistance of five ohms should be considered as the maximum limit for LP gas installation, as protection against lightning and static charges.

Paint tanks white

Recommended, based upon recent tests, is that LP gas storage tanks should be painted with a fume-proof, slow-chalking white paint to reduce the pressure built up in tanks during hot summer months. The tests have shown that white paint is the best reflector of sunlight and holds its reflectivity over a long period of time. This recommendation is made in preference to aluminum paint which loses its reflectivity when it loses its original luster.



A standard method of grounding an LP gas system and the adjacent trackage.

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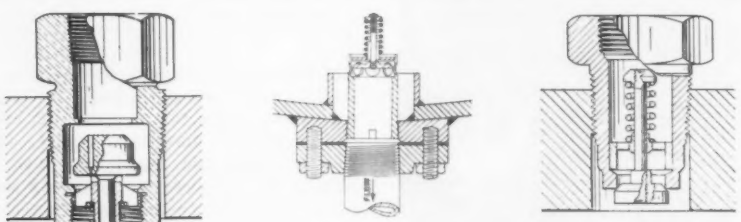


The new type of excess flow valve, left, has Underwriters' Laboratories approval for outside mounting. The excess flow valve, center, is approved for bottom outlets. The mounting of a filler valve in the manway cover is shown at the right.

Radiant Gas Processing Equipment Makes Superior Well Casing

(Continued from page 17)

as they travel through the furnaces to prevent overheating of the ends and then, as they emerge from the last furnace, tubes must speed up again so that the ends are separated before the push-off mechanism operates to remove the casings from the conveyer.

This control is automatic and is actuated by instruments measuring the metal temperature as the casings move along the line.

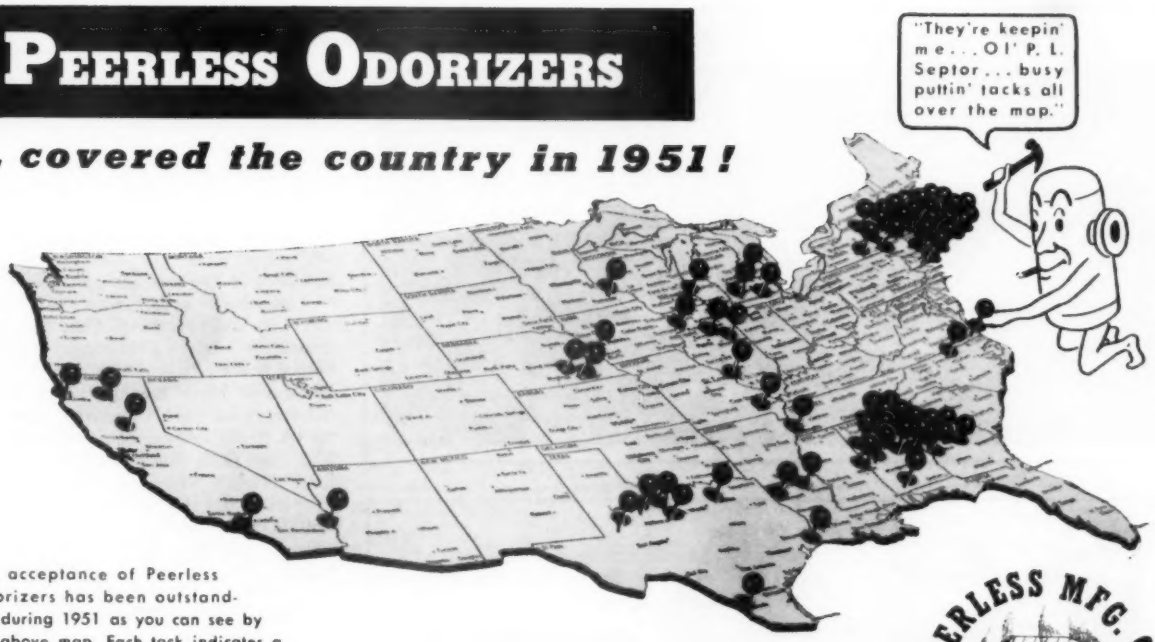
In the initial presentation, after five years of operating experience, Fred H. Bremmer, chief combustion engineer, and F. J. Zehnder, development engineer, of Spang-Chalfant, told a recent meeting of the Association of Iron and Steel Engineers that one of the physical properties required for Grade N-80 casing in the API specifications, is a minimum yield strength of 80,000 psi and that "the secondary objective for the use of this continuous heat treating equipment is for the production of upset end casing having a minimum yield strength of 110,000 psi for use in extremely deep wells . . . experiments have been quite successful, and the material produced has met all the physical properties required for this higher grade of casing."

A thorough study of the physical properties of the casing produced by the high-speed radiant gas processing line has shown that these casings are equal to and, in most cases, superior to the properties of commonly used normalized-and-drawn manganese-molybdenum casing.

The Spang-Chalfant engineers noted that the service history, in the oil fields, for the total production of more than seven million feet of casing has been very good; there have been no reports of failures of the casing.

PEERLESS ODORIZERS

. . . covered the country in 1951!



The acceptance of Peerless Odorizers has been outstanding during 1951 as you can see by the above map. Each tack indicates a Peerless Odorizer installation. Gas Companies are finding Peerless Odorizers accurate for metering odorant into natural gas lines. Operational costs are reduced to a minimum.

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ACCURATE GAS PRESSURE

The RS Standard Dead Weight Gage facilitates testing gas pressures; rock pressure at wells; static pressure on orifice meters and pipe line pressure in locating leaks. The design of the gage is based on the principle of applying pressure by a known weight to a hydraulic piston of known area; and of the converse effect to measure unknown pressure by balancing its force on a piston of known area with a known weight.

The instrument is calibrated to indicate pressures with a precision of 0.1%.

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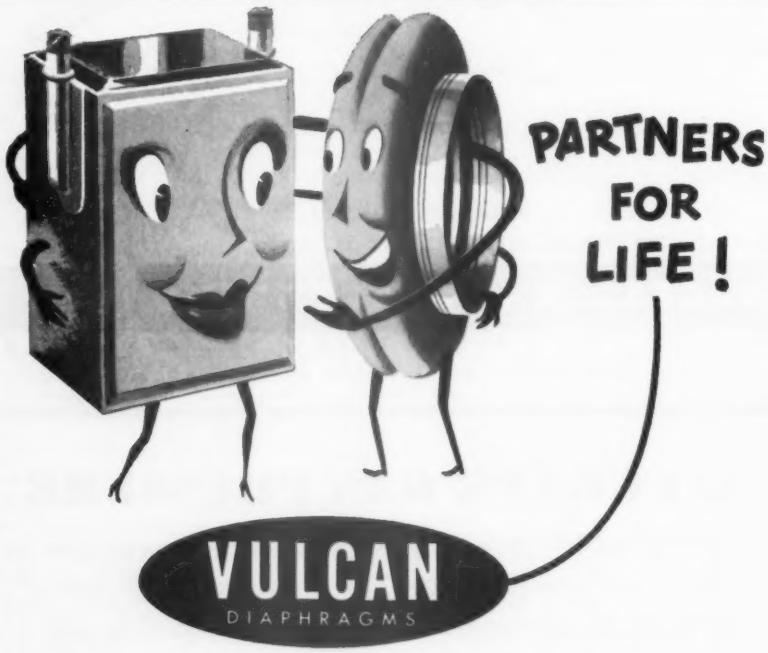
THE GAMA 1952 EXPOSITION



VULCAN Diaphragms in meters, regulators and controls should serve faithfully for a long and accurate service life.

Why waste time and money on diaphragm replacements?

Why waste time and money on periodic oiling of diaphragms?

VULCAN Diaphragms are scientifically made for utmost strength, perfect pliability. They remain tough yet supple and sensitive year after year in the most exacting service. They contain no oil, yet never need oiling. They work in bone dry gas or at 100% saturation, in all types of gases. They repel gums and condensates . . . never dry out and stiffen.

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FPC SAYS . . .

TRANSCONTINENTAL-TEXAS EASTERN

Transcontinental Gas Pipe Line Corporation and Texas Eastern Transmission Corporation have a joint certificate authorizing the operation of an interconnection, near Philadelphia, of the natural gas pipeline facilities of the two companies.

Temporary authorization for the construction and operation of the facilities was granted by the FPC last May 15. The facilities are used for deliveries by Transcontinental to Texas Eastern, which in turn is delivering for the account of Transcontinental up to 60 million cubic feet per day to The East Ohio Gas Company, New York State Natural Gas Corporation, and The Peoples Natural Gas Company; up to 10 million cubic feet to United Natural Gas Company; and up to 600,000 cubic feet to Indiana Gas & Water Company.

ROCKLAND LIGHT-ROCKLAND GAS

Rockland Light and Power Company, of Nyack, N. Y., has been authorized to acquire and operate natural gas properties, located in Rockland and Orange counties, N. Y., of Rockland Gas Company, Inc., of Spring Valley, N. Y.

TEXAS-OHIO GAS CO.

Applications by Texas-Ohio Gas Co., of Houston, Tex., for authority to construct a 1,406-mile pipeline extending from Texas to Ohio and to import natural gas from Mexico, have been denied.

The Commission found that the company "has failed on this record to show that the proposed service, construction or operation is or will be required by the present or future public convenience and necessity."

The pipeline, estimated to cost $185,000,000, would have extended from the U. S.-Mexican border in Hidalgo County, Tex., to a terminus near Lancaster, Ohio. Texas-Ohio planned to sell all of its gas to Reserve Natural Gas Company, a newly formed corporation, at the Ohio terminus of the line. On a 95 per cent load factor basis, Texas-Ohio would require 480 million cubic feet of gas per average delivery day, plus 32 million cubic feet for fuel gas and line loss, or a total of 512 million cubic feet daily.

ALGONQUIN GAS TRANSMISSION

The Commission will reconsider its order of October 31 dismissing an application by Algonquin Gas Transmission Company for a temporary certificate authorizing it to commence operation of its pipeline system, now virtually completed, in New England.

An oral argument will be held before the Commission in Washington, on November 24 on the single issue of whether or not Algonquin's application for a temporary certificate comes within the purview of the authority of the FPC to grant. Hearings in the reopened proceedings involving New England natural gas service, previously scheduled to commence November 24, have been postponed to November 25.

Effects of Gas Conditioning

(Continued from page 28)

they may be gasborne as with manufactured gas. We continue to insist that gum protective devices be provided on all constantly burning pilots on new appliances.

We felt that we might expect a sharp increase in fast meters after conversion to natural gas. In order to determine this under our conditions—it has been our continued practice to use oiled leather diaphragms and dipping oil in our meters—we decided to make an accelerated meter test with dry natural gas.

21 meters which had been used on manufactured gas for periods of from seven to twelve years were removed from customers' premises, capped to exclude air, tested for accuracy in the customary way, purged with gas immediately after test, and capped and then each one installed, in series with a new meter and operated with dry natural gas on accelerated consumption rates.

After the trial run, the average proof of the new meters was 100.3 per cent, and of the old meters 99.4 per cent, indicating a slight speed-up of meter proof.

We concluded that our practice of using diaphragm dipping oil in our meters was of marked help, and that this, together with our planned gas conditioning program, ought certainly to reduce the tendency toward drying out of the meter diaphragms and of the meter shaft packing.

A comparison of our meter tests for the year 1949—the last full year of our operation on manufactured gas—with the year 1951—the first full year of our operation on natural gas—and with the last six months' tests (March through August 1952) reveals the following:

Meters	1949 Tests Avg. 12 Mos. (Per cent)	1951 Tests Avg. 12 Mos. (Per cent)	1952 Tests Avg. 6 Mos. (Per cent)
Testing O.K.	75.15	69.97	78.73
Above 102%	7.74	6.05	5.42
Below 98%	15.44	23.07	15.85

The percentage of fast meters increased gradually after conversion. However, this trend has not only been stopped, but it has been reversed.

An excerpt from a report by I. F. Leonard, superintendent of our meter shop, follows:

"After carefully examining thousands of gas meters which have been returned to the Meter Repair Shop for various reasons, and which have been operating on natural gas for periods varying, for a few meters, from one month, with the majority, up to 23 months, we found that the majority of the diaphragms, both new and repaired, are showing the beneficial effects of our meter practice and gas conditioning program. There is a very noticeable improvement in the condition of the diaphragms—they are changing from the normally black color, usually found under manufactured gas operations, to a light reddish-brown—resembling new treated leather. This condition was first noticed in the early months of 1951 and is increasing with the length of time the meters have been operating on natural gas. Another encouraging factor is the decrease in the number of meters found with hard diaphragms. This indicates that we may expect further improvement in meter proof. The 'tar deposit'—gum—is becoming softer and in some cases has disappeared from the leather entirely. We believe that the softening of the leather is also reflected in the improvement in the proof of the meters tested during February, March and April, 1952.

"In view of our findings, we feel that there is a trend which indicates that we may have passed the peak of the fast meters and that we can expect our meter proofs to return to normal."

A month later, Mr. Leonard again reported:

"The diaphragms have continued to improve and they are found to be in such condition that we feel many of them will last an additional five years. We have every reason to believe that the condition of the leather will improve, resulting in a larger number of diaphragms which can be reoiled and used. In view of the above, we have reoiled about 400 of the best 14-year-old 1938-five-light diaphragms for a five-year field test."

It has been almost two and a half years since we introduced natural gas into our system. During this period we have had no evidence of dust movement nor has the volume of "unaccounted-for" gas increased disproportionately. We have had very little trouble maintaining satisfactory odorant concentration. There has been no indication of excess fogging oil in gas pressure regulators, meters, or at the customers' appliances. Inspection of pipe removed from the distribution system has shown that the interior surfaces are moist and oil wet. For about one year after the completion of conversion, gas meters exhibited a moderate tendency to go "fast", but proof has now returned to a level comparable to pre-conversion days. We are predicting that as time elapses meter proof will improve still further.

We firmly believe that our gas conditioning program, which includes humidification as well as oil fogging, has paid big dividends in maintaining good service to our customers and in keeping our distribution operating costs low.

Adapted from a presentation to American Gas Association 1952 Convention

What does

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SUPERIOR METER COMPANY, INC.

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(Continued from page 27)

tion mains involves greater difficulties than when applying it to coated piping. On bare lines in urban networks, it is usually advisable to locate the actively corroding areas, and apply protection at these points rather than attempt to fully protect the entire main as is readily possible when dealing with coated lines. Hot spot protection on bare lines requires considerable field testing and installation of protective current sources (usually galvanic anodes) at many points on the system rather than at relatively few points as when working with coated pipe.

Services

On many properties, replacement of corroded service lines is a major problem which involves not only the expense of lost gas and pipe replacement but includes loss of public good will through the nuisance and interruption of service. Much has been done to develop the technique of replacing service lines with a minimum of excavation work, such as by pulling copper tubing through a steel service line being replaced. More emphasis is needed on designing original service installation procedure so that the lines will be corrosion free or at least highly corrosion resistant.

If steel service lines are installed bare on non-cathodically protected mains, the best corrosion protection can be afforded by eliminating dissimilar metal galvanic couples with the proper use of insulating devices. A particular source of trouble can be electrical contact with the water system through water heaters or other equipment. If such a contact does exist and if the water service line is copper in a closely paralleling trench, the corrosive stress on the steel gas service can be particularly severe. Lead water service lines will also adversely affect steel gas services but to a lesser degree. If water services are steel but the water mains cast iron, the cast iron coupled electrically with the steel gas service will tend to corrode it as well as the gas mains if also steel. If the steel gas service is attached to a cast iron gas main, galvanic corrosion can similarly be a problem in corrosive areas.

Steel service lines on cathodically protected main systems normally must be insulated at the customer's meter loop in order to confine the protective current to gas mains and services.

Copper services, either original installations or replacements, should be insulated at the main and at the meter loop. This is necessary not because the copper service will corrode, but because the copper, if not insulated, will contribute to corrosion of gas mains and customer's piping through galvanic action.

In the past few years, many insulating devices have been made available by manufacturers as gas distribution companies became increasingly aware of the advantages of service insulating programs.

Most of these devices have been designed for use in meter loops and include plastic nipples, bushings, and meter swivels; insulated compression fittings; insulated pipe couplings; and insulated meter nuts.

Some of the large meter manufacturers can now supply meters equipped with insulated meter nuts instead of the standard variety. This is particularly convenient for programs calling for insulation of all new services since procurement, stocking, and installation programs are simplified. Insulated meter nuts cannot, however, be used where meter bars are employed since the bar will completely short circuit the insulation. In such cases, devices which can be used in the loop ahead of the meter are suitable.

When insulating at the main, compression-type insulating fittings appear to be satisfactory. Some recent trends have been toward the use of main-tapping fittings combined with compression-type insulating fittings. One particular caution to observe when selecting a method of insulating services from cast iron mains concerns the main-tapping fittings between the main and point of actual insulation. If these fittings are of a material which will tend to corrode through galvanic action when in contact with cast iron, the corrosion may be very severe in low resistivity soils because of the relatively small area of the corroding fitting. To eliminate this potential weak point, the main tapping fittings should be of a material electrically neutral to cast iron or slightly corrosive to it then by coating this small fitting. Any corrosive stress on the cast iron main will be eliminated for all practical purposes.

Although manufacturers have been active in producing service insulating devices, the market is still open for additional devices which will sell at lower unit prices while still meeting requirements of mechanical strength, high insulation level, gas tightness, retention of effectiveness at reasonably high temperatures, and ease of installation—particularly at existing meter loops. For existing meter loops, a reliable device that could be installed without interrupting service would be particularly valuable.

If an insulating program for new services is considered for a system, it will usually be found that the cheapest and most simple procedure is to insulate all services as standard practice rather than attempting to insulate only those services which are installed in what are thought to be corrosive areas. Unless all services are insulated it will be difficult to avoid accidental installation of uninsulated services in corrosive areas.

Recently, interesting development work has been done on the use of plastic tubing for small service lines. This work is particularly worthy of note in view of present shortages of copper and steel. Serviceability as a gas carrier is claimed to be satisfactory as the plastic used is resistant to sour gases, maintains a permanently smooth interior surface, is light weight, easy to install, and is tough. From the corrosion engineer's viewpoint, a plastic service which meets the approval of the gas engineers is ideal for his corrosion control program since the plastic service itself is essentially corrosion proof and has the additional advantage of being a fully effective insulator between gas mains and customers' piping thus eliminating the need for insulating devices at the main and at the meter loop.

When using plastic services such as this, caution is again advisable in selecting the main-tapping fittings between the main and the plastic tubing to be sure that they are either of essentially the same material as the main or slightly corrosive to the main and coated.

In the field of cathodic protection, service lines are usually protected along with mains placed under cathodic protection. There are some locations where it is desired to cathodically protect steel service

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lines attached to cast iron mains. This is done at main and meter, coating the service, and cathodically protecting it with a small galvanic anode.

Aboveground Installations

Protection of aboveground installations subject to atmospheric corrosion is primarily the function of protective coatings and paints. Most distribution companies have standard coatings and paints which perform well in the majority of their aboveground installations. In those cases where corrosive industrial atmospheres, salt air atmospheres, or other conditions cause early failure of standard coatings, special protective materials are required.

In recent years, manufacturers have made marked advances in the development of paints, plastic coatings, sprayed metal coatings, etc., which can be used to advantage in the particular applications to which they may apply.

At meter installations, corrosion problems are often encountered at the ground line on service riser pipes. This is best taken care of by extending protective pipe coating above the ground line, where coatings are used, or by applying coating at the ground line using various suitable insulating tapes or a proved pipe coating material.

Adapted from a presentation to American Gas Association 1952 Convention

NYPSC Orders Safety Work

New York utilities supplying gas service to 3,500,000 homes and businesses, and the interstate pipeline companies transporting gas by pipeline in this state were ordered early this month by the Public Service Commission to undertake immediately a program of safety measures to guard against gas explosions on their transmission and distribution facilities.

An opinion by the Commission's chairman, who conducted a state-wide investigation into the safety of gas systems, rebukes certain interstate pipeline companies for their construction practices and warns that in the future the interstate pipelines and their contractors will be held to strict account for any "wilful" actions against persons or property in New York State.

The opinion stated, "Certain of the pipeline companies and contractors acting for them have dealt arbitrarily with residents of this state, causing damage to their properties during the construction of pipelines and related facilities. Serious consideration should be given by the Legislature at the next session to the enactment of legislation rendering such companies and their contractors liable for treble damages for any wilful, culpable negligence causing injury to persons or damage to property in this state during the construction of pipelines and appurtenances thereto."

In recent months, residents of one section of Westchester county complained that Algonquin Gas Transmission Company, which is building a line across Westchester to Connecticut, has trespassed on their property causing damage and hazards to the public. The matter is now in litigation.

The Commission's safety order sets forth codes covering the operations of local distributing companies and standards of construction, operation and maintenance by interstate companies.

The work to be done under the PSC order will cost New York gas companies more than $6,000,000. No estimate for the interstate pipeline companies is available.

400 Supplers Wassail

More than 400 members of the gas industry gathered on the first evening of the AGA convention to celebrate the 15th annual Wassail of the Gild of Ancient Supplers of Gas Appliances, Skills, Gins, Accessories and Substances. Those who attended, by invitation only, numbered about 200 Supplers and 200 Burghers, the latter being gas company executives from all over the country.

Presiding over the Wassail were Mayor Stephen D. Day of Houston, and Master-of-Revels Alvin M. Stock of New York. Old English atmosphere was provided by a group of musicians in traditional wassailers costumes. The general reception was followed by a sumptuous buffet featuring roast beef.

In the annual meeting which preceded the Wassail, the Gild heard reports indicating financial condition and peak membership. New members invited during the year numbered 24, bringing the total to 308.

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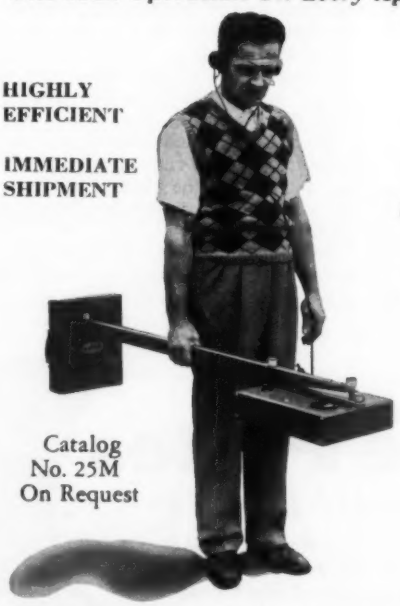

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Substitutes—When and How?

(Continued from page 16)

Out of all of these research efforts should come a better understanding which will permit one to choose with clearer vision the best process steps to be employed in a plant to be located in a particular environment. Although much of the published data on catalysts indicates that efforts have been concentrated on the production of liquid products rather than gas, information is available pointing the way to reaction conditions which favor gas production instead of liquid hydrocarbons. Further studies along this line should be made.

Before starting the construction of a plant for making substitute gas, a careful study of the plant location must be undertaken for a number of important reasons. The plant will eventually require large quantities of coal and water, hence nearness to a goodly supply of these materials is a practical necessity. Furthermore, the proximity of such a plant to a large pipeline network which can absorb the plant's output at a relatively uniform rate is a very important consideration.

It might be well to take you through the steps as I visualize them at present, leading to the assembly of a 100 billion Btu plant for making substitute gas and the steps of producing such gas.

Let us start by assuming that we have established the plant on a site which will be within easy transportation distance of the coal supply and located on a river. The plant will require somewhat more than 6500 tons of coal per day and this calls for the necessary coal storage and handling equipment. It is to be noted also that the water requirements are some 15 million gallons daily. The output or generating capacity for the mixture of carbon monoxide and hydrogen is approximately 400 million cubic feet per day.

An oxygen generating unit is a necessary part of the plant; this is something relatively new in the production of gas in this country, although it has been found most useful in the gasification of certain noncoking coals in Europe. Based on the assumption that the efforts now being made culminate in the development of a process adapted to economically gasify any kind of coal in a granular to powdered state in a stream of oxygen and steam, an oxygen generating unit having a daily capacity of 90 to 95 million cubic feet will be required.

Besides the multiple gas generating units there will be the necessary cooling, scrubbing, pumping and purifying equipment and a plurality of reaction vessels confining the synthesis catalyst, through which vessels the purified carbon monoxide and hydrogen gas is passed to promote the synthesis of methane and other light hydrocarbons.

First the coal is prepared and sized in accordance with the selected gas making process; it may be very finely powdered as required in powdered fuel gasification processes; it may be coarsely granular as used in still another known process, or it may be sized ⅛ to ½ inch and free of dust, and gasified in this state. At any rate the gas produced from the prepared coal, referred to as synthesis gas, is comprised essentially of carbon monoxide and hydrogen with more or less carbon dioxide. This gas is freed from most of the carbon dioxide by washing it with water while it is under suitable pressure, and it is freed of sulfur compounds by passing it through a purification system; this latter step may be of very great importance according to the type of synthesis adapted, the nature of the catalyst adapted, the nature of the catalyst employed in the synthesis steps, and the initial sulfur content of the raw synthesis gas. In the event that the synthesis gas does not contain hydrogen and carbon monoxide in the proper ratio favorable for the synthesis of the substitute gas the ratio is changed by treating it with steam at elevated temperatures in contact with an iron catalyst.

The produced and purified synthesis gas is then passed at high pressure through the reactors at controlled rates, contacting the catalyst for an appropriate period of time at a temperature of the order of 700° F. The hydrogen and carbon monoxide initially present in the purified gas react with one another under these conditions by virtue of contact with the selected iron catalyst forming chiefly hydrocarbon gases with some carbon dioxide and water vapor. The gas leaving the reactors is cooled, scrubbed to remove moisture, readily condensable hydrocarbons and carbon dioxide. This cleaned and dehydrated gas, leaving the scrubbers, is the finished, substitute gas.

Depending upon the details of process one can predict practical operation with the production of gas having a calorific value of 800 to 1,000 Btu but of course as the heating value is raised from 800 to 1,000 Btu the cost per Mcf as well as the cost per therm increases. The choice of heating value, therefore, will probably be deferred until a later date when the economics of operations are more accurately defined.

The question which next comes to mind is the cost of the substitute gas.

The unit capacity cost of a production unit will be relatively great. Hence its operations will normally be held as uniform as conditions permit. This means that during the summer its product must be delivered either to underground storage, to seasonal markets which will purchase the output at reasonable rates, or lacking either of these facilities, the plant would supply as much of the base load requirements of existing markets as conditions permit.

It is seen therefore that the location of the plant will be affected by a number of factors which influence its operating costs and output schedules. Furthermore we are not now able to decide upon the exact type of plant which will be built. For these reasons current estimates of the cost of substitute gas have varied widely even though in all cases 95-100 per cent load factors have been assumed.

If coal were delivered at the plant at $4.00 per ton the current cost of substitute gas delivered to the pipeline has been variously estimated at between 55¢ and 65¢ per Mcf.

The cost of process fuels included is between 27¢ and 32¢ or some 50 per cent of the total. For each $1.00 change in the

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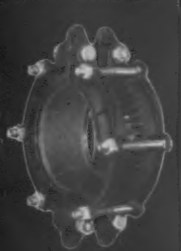

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cost of coal the cost of gas will change about 6¢ per Mcf. Thus, if coal is $6.00 per ton the above costs would be about 67¢ to 77¢ per Mcf.

While these costs seem high at the present time and compare to perhaps a 40¢-45¢ cost for southwestern natural gas delivered to the Pittsburgh area we should not overlook the fact that we are only at the beginning of a large scale coal gasification research and development program and there is every reason to anticipate a relative reduction in substitute gas costs.

Conversely, natural gas rates appear to be increasing as a result of inflationary pressures long overdue.

I mention the recently publicized coal hydrogenation operations by the Bureau of Mines and The Union Carbide Company—So far this process has no place in the search for a substitute gas. The hydrogenation process is much more costly per unit of product than gasification and while it produces hydrocarbons, they belong to a different group of hydrocarbons not particularly suited for producing gas but very valuable in the chemical industry.

I would urge that all gas companies, whether natural or manufactured, give thought to this subject. The industry is now highly integrated and will no doubt become more so, hence few individual companies can long remain detached from this basic problem.

Curtailments and restrictions are *not* a substitute for a supply of gas. We should look forward to supplying adequately our markets. To ignore this responsibility is to court economic losses to our industry.

Continued research and study of the supply problem are essential and should be a permanent part of our PAR activities since when the need for a substitute natural gas arises we should be prepared to start with as little change in gas characteristics and operating economics as possible.

Unless such adequate preparations are made, our industry may once again be subjected to the strains of gas shortages with consequent danger of market loss to competitive services.

What Will Happen . . . ?

(Continued from page 20)

would be better than a higher rate which might hold good for only a very short period.

The attitude of the banks in this respect is important, especially in view of the thought expressed in responsible quarters that corporate borrowing needs may slacken in 1953. Such a development would not justify an increase in the borrowing rate, certainly not in view of the Federal Reserve System recently showing a greater inclination to supply needed reserves to the banking system.

The volume of new financing by the gas industry to date in 1952 has been disappointing when viewed both in relation to its own 1951 figure and to the trend of the electric utilities this year. While no great pick-up in financing is anticipated by industry sources, funds should be available at a satisfactory rate when, as and if needed, according to the expectations of Bankers Trust Company.

"While this year's $10 billion of new institutional funds seeking investment has been generated in a period of prosperity and full employment, there is reason to expect only a moderate decline in the event of some slackening in general business," Roger F. Murray, vice-president of the bank, told the group. "Reference to past experience indicates the high degree of stability inherent in the bulk of these savings. It seems reasonable to believe that for 1953 and 1954 we can count upon a flow of funds of comparable size, perhaps in the $8 to $10 billion range. Thus, the outlook for the supply of funds seems satisfactory.

"The more critical question is how much competition the gas industry will encounter in trying to attract its share of the available total."

Texas Gas Opens Houston Office

Texas Gas Transmission Corporation announced the opening of an office in the Melrose Building, Houston, Texas, to facilitate its gas supply activities.

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November

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20-22 South. California Meter Assoc., instrument maintenance course, Los Angeles Harbor Jr. College

February, 1953

2-4 AGA Home Service workshop, Baker Hotel, Dallas.

March, 1953

16-20 National Association of Corrosion Engineers, Hotel Sherman, Chicago.

26-27 NEGA, Hotel Statler, Boston.

27-29 Mid-West regional gas sales conference, Edgewater Beach Hotel, Chicago.

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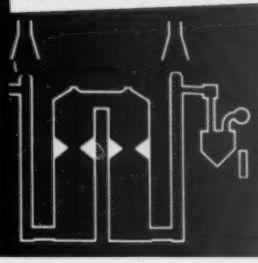

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